STS-105 Run 2

*2915873 *

9/5/01

PROCESSING OPERATIONS CONTROL
OMI PLANNING SHEET

Wad Number	SITE	Elem CD	End Item	
S6444-J01-R02	LCC	V	103 FLT: 030	DATE: 08/09/2001 TIME: 18:53:36

Title: SSV ICE AND DEBRIS ASSESSMENT

Sub Element/Zone: 30

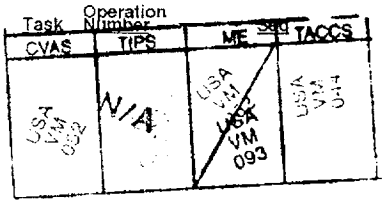
Project Work Order No.	Hazard:	SFOC Safety	
	☒ Yes ☐ No	No Total Block	☒ Local Copy ☒ Firing Room Copy

Authorizing Document	Material & Equipment:	MICR Req'd	OMRS:
ORB330	☒ Yes ☐ No	☐ Yes ☐ No	☒ Yes ☐ No

PERFORM THE FOLLOWING:

Pre-Ops Setups

Task	Operation Number	Seq	Steps



OPS Support

Task	Operation Number	Seq	Steps	Task	Operation Number	Seq	Steps

Operating Instructions

Task	Seq	Steps	Task	Seq	Steps
	010			090	
	020			100	
	030			110	
	040			120	
	050			130	
	060			140	
	070			150	
	080				

Post Ops

Task	Operation Number	Seq	Steps

Appendices

Task	Seq
N/A	

USA VM 005

USA VM 094

Subtask WAD's

N/A

Planner	Ext	QC Closure	Date	Page
A McCloud	6523			1 OF 1

USA 32-82 Rev 05-99 (Flow)

OMI TASK CLOSEOUT CHECKLIST

OMI No.	Run No.	Task Control No. (TCN)
26444 Rev. 5-01	Run 2	2115373
Start Date	**Completion Date**	**Closure Date**
8/9/01	8/31/01	8/31/01

		QC/Eng.	Date
1.	Deviation Index: Verify total number of deviations agree with index. Verify entry is correct into OMI.		8/31/01
2.	Constraints List: Verify all constraints are accepted by QC or waivered by Engineering. Verify that constraints list is complete and closed. SUBTASKED TO S0017 R. Seale ETM 8/31/01	N/A	N/A
3.	IPR's: Verify that all IPR's are closed or upgraded to problem reports or dispositioned as no constraint to OMI closure and incorporated in central IPR system and a copy of the central IPR sort attached.		
4.	Verify that material and equipment requirement list enclosed (if applicable).	N/A	N/A
5.	OMI: Verify that all pages or verification sheets are completed, stamped, and dated in the lower left/right hand corners.		8/31/01
6.	OMI: Verify that all miscellaneous documents/procedures have sequence number referenced and stamped; e.g., photos, sample results, etc.		8/31/01
7.	Planned/task/OMI satisfactorily completed. OPR: R. Seale ETM 8/31/01		8/31/01
8.	LSS review prior to closure for CIL OMI's. MMC N/A Thiokol N/A		

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

SSV ICE AND DEBRIS ASSESSMENT

Element/End Item: **ALL**
Flow/Usage: **ET-103 & SUBS**
Facility: **LC 39**
Design Center Concurrence: **MSFC/JSC**
Category: **B**
OPR: **ETM**
TTL ORG: **SE**

This document contains HAZARDOUS operations.

KENNEDY SPACE CENTER - SPACE TRANSPORTATION SYSTEM

Table of Contents:

1.0 INFORMATION

1.1 Objective

Provide necessary tasks that document, monitor and evaluate ice and debris conditions to eliminate or minimize debris concerns of the integrated SSV during ET tanking, FRF, launch, and associated detanking.

Description

1. This OMI is performed as subtask to S0007/S0014/S0037.

2. This OMI provides documentation of ice/debris activities:

   A. Pre-launch icing briefing

   B. Pre-launch debris inspection

   C. Countdown - Based timeline evaluation monitoring of ET TPS surfaces using OTV

   D. OTV monitoring of seal/flange areas for cryogenic leakage

   E. SSV OTV monitoring for debris conditions during countdown

   F. Cryogenic replenish inspection for evaluation of SSV and facility debris concerns or anomalies

   G. Evaluation of concerns/anomalies in the event of ET detanking

   H. Review of engineering film data for SSME ignition, launch, ascent, ET separation, and orbiter landing.

3. Orbiter landing debris information is contained in the NASA publication for Ice and Debris Assessment. That report is referenced in this OMI for continuity of debris data.

1.2 Special Instructions All Operations

1. This OMI is run as a subtask to OMI's S0007, S0014, and S0037. All PAD clearing and controlled access operations will be performed per those OMI's.

2. Constraints will be statused by controlling OMI's S0007/S0014/S0037.

3. The OTV camera numbering scheme for PAD A/B is 0XX/1XX.

4. Task Team Leader assignment: NASA PH-H is TTL for L-20 Hour Walkdown, Final Inspection, and Post Launch/Drain Walkdown. ETM is TTL for all other operations.

5. From time stable replenish mode starts until start of final SCAN, scanning with individual cameras should be performed approximately once per hour.

6. Cameras 061/161, 063/163, and 070/170 may be released to NASA select with CICE concurrence.

7. All personnel participating in final inspection and post drain walkdown shall be current in following training:

   A. Emergency PAD egress

   B. Fire fighting

   C. ELSA

8. Milestones:

   A. MLP portion of post launch walkdown commences at approximately T + 1 hours.

   B. PAD acreage portion of the post launch walkdown commences at approximately T + 2 hours. (may be deferred until preferred daylight hours.)

   C. Post drain walkdown commences at approximately T + 4 hours after drain initiated (typically 1 1/2 hours after LH_2/LO_2 low level sensors dry).

9. Hands-on investigation required for all ET-TPS defects suspected of violating NSTS 08303 ice/debris inspection criteria.

10. From time launch scrub is declared until 1.5 hours past time LH_2/LO_2 low level sensors read dry, OTV camera scanning shall be performed approximately once per hour.

11. OTV cameras 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, 067/167, 068/168, 069/169, 070/170, and 071/171 shall be used to monitor LO_2/LH_2 tank drain operations.

12. Excessive vapors are defined as being more severe than that described in NSTS 08303 - Ice/Debris Inspection Criteria or NSTS 16007 - Launch Commit Criteria - Hazardous Gas Subsystem.

13. Quality coverage is not required for performance of this OMI. Ref SFOC-GO0007, Ice and Debris Team Operations are exempt from quality coverage. The ROR (CTIF) performs the CMQC function for all non-hazardous operations.

14. Personnel using Sony DKC-ID1 camera shall verify lithium ion battery is securely locked in the bayonet fitting and the lithium button battery door is securely locked and taped in place.

15. Verify camera flash is deactivated.

16. Personnel using Kodak DC 50/120 camera shall verify alkaline batteries are properly installed.

17. Personnel using digital cameras shall not operate in H_2 leak or O_2 rich environment (23 percent or greater).

18. Personnel using the Sony MVC-FD91 camera shall verify the lithium ion battery is securely locked and the battery door is locked closed. Personnel shall verify that both battery doors (lithium ion and lithium button) are closed and taped shut.

19. Personnel shall verify that cameras and equipment are securely tethered when at the PAD while the SSV is present.

1.3 Operations List

Operation		Shop/ Cntl Rm Console	OPR	Haz (Y/N)	Duration (Hrs)
No.	Title				
10	Support Preparations	STM/ FR2	ETM	N	0.2
20	Ice Prediction Briefing	SE/ NA	ETM	N	0.5
30	Pre-launch Walkdown	SE/ NA	ETM	N	2.0
40	Ice Frost Debris Console Initial Configuration Setup	SE/ FR2	ETM	N	3.0
50	SSV Debris Assessment	SE/ FR2	ETM	N	18.0
60	Group 1 Monitoring LO2 Chill Down Thru T-0	SE/ FR2	ETM	N	15.0
70	Group 2 Monitoring - LH2 Chill Down Thru T-0	SE/ FR2	ETM	N	15.0
80	Final Inspection	SE/ FR2	ETM	Y	3.0
90	LO2/LH2 Drain Monitoring	SE/ FR2	ETM	N	4.0
100	Console Securing	SE/ FR2	ETM	N	0.5
110	Summary Tape	SE/ FR2	ETM	N	18.0
120	Post Drain Walkdown	SE/ NA	ETM	Y	2.0
130	Post Launch Walkdown	SE/ NA	ETM	Y	3.0
140	Film Review	SE/ NA	ETM	N	15.0
150	Final Report	SE/ NA	ETM	N	0.5

2.0 SAFETY INFORMATION

2.1 Hazards

	Operation
1. Working at unprotected heights.	
2. Walkdown at PAD while SSV is in stable replenish mode.	

2.2 Safety Requirements

	Operation
1. If lightning activity is forecast to be within 5 miles of launch PAD, CTC and SFOC safety shall implement provisions of adverse/severe weather and lightning policy contained in GSOP 5400 Ground Safety Operations Procedures.	
2. There are no safing/shutdown or evacuation steps required in this OMI.	
3. Hazardous operations within this subtask OMI will not be started until safety concurrence to proceed has been given per the integrated OMI controlling this subtask.	

2.4 Reference Safety Documentation

Number	Rev	Title
KHB 1710.2	LI	KSC Safety Practices Handbook
GSOP 5400	LI	Ground Safety Operating Procedure

3.0 STAGING REQUIREMENTS

3.1 Referenced Engineering Documentation

3.1.2 Documents

OPERATION 120

Document No.	Rev	Title
NSTS 08303	(LI)	NSTS PROGRAM ICE/DEBRIS INSPECTION CRITERIA

3.2 Parts, Materials, Equipment, and Special Tools

3.2.8 Personal Protective Equipment

OPERATION 30	**Nomenclature**
	safety harness
	lanyard
OPERATION 80	**Nomenclature**
	safety harness
	lanyard
	Nomex coveralls with gloves and hoods
	ELSA
OPERATION 120	**Nomenclature**
	safety harness
	lanyard
	hardhats
	flame retardant coveralls
OPERATION 130	**Nomenclature**
	safety harness
	lanyard
	hardhats
	flame retardant coveralls

4.0 PLANNING REQUIREMENTS

OIR Required Yes [ ], No [X]

4.3 LPS Requirements

4.3.1 Computer Systems

PC GOAL
CCMS Configuration
CDS
CMS

GSE Links/HIMs

Link	FEP	Location	HIM	Octal Addr	Function

DPS Configuration

OPS Mode - ___
Dedicated DEU/DDU - ___

Vehicle Links and Formats

Link	FEP	Freq	Downlink	Downlist

Control Room Consoles Required

SDC/RTIF Configuration

RPS Configuration

Link	Freq	Element	Downlink Format

ESA monitors/hot spares

CCS Configuration

Link	FEP	Location	HIM	Octal Addr	Function

CCS Consoles Required

4.4 Support Services, Commodities, and Equipment

4.4.2 Communications

(Per controlling OMI S0007, S0014 or S0037)

Voice Recording:

Radio nets:

Paging:

Area warning:

Portable radios (loan pool):

Type	Qty	Net/Freq	Record	Duration/Purpose

Portable OIS units:

Special communications:

4.4.3 OTV

(Per controlling OMI S0007, S0014 or S0037)

OTV Cameras required: 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, 067/167, 068/168, 069/169, 070/170, and 071/171

OTV Cameras to be recorded: 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, 067/167, 068/168, 069/169, 070/170, and 071/171

OTV Monitor:

Special OTV requirements:

4.4.4 Countdown Display/Status

Display Required	Bldg	Room	Operation Time
Timing	LCC	FR2	Duration of Test
Countdown and GMT	LCC	FR2	Duration of Test

4.4.8 Services

Service/Special Requirements	Location	Purpose
SPOC Safety	LC-39 A&B	Safety Support
NASA'S (8)	LC-39 A&B	Inspection Team Use
Radio Net 105	LC-39 A&B	Inspection Team Use

4.4.12 Propellants, Gases and Chemicals

Commodity	Spec No.	Quantity	Rcvr	Location	Minimum Press	Delivery Time
LN_2	SSS-0073 -6.3-5	Min 750 Cu ft	DH-H 861-3645	Pad 39B Camera Site 2	3000 PSI	1 week prior to T-0

5.0 CONFIGURATION ACCOUNTING AND VERIFICATION

5.1 Specific OMRS Requirements Satisfied by this TOP

OMRS NO.	NOMENCLATURE/ EFFECTIVITY	SEQ-STEP (CAP)
S00E[illegible]	ET TPS MON DURING DETANK TAF;0	90-005
S00E[illegible]	POST DETANK ET TPS INSPECT TAF;0	120-002
S00FA0.[illegible]	PRELAUNCH WEATHER BRIEFING (L-1 DAY) VAF1-90	20-001
S00FB0.[illegible] (1)	ET TPS SURFACE MONITORING T23,27-29,31-999	60-012 70-012
S00FB0.[illegible] (1)	MONITOR GO2 VENT HOOD VAF1-90	80-021
S00FB0.[illegible] (1)	MONITOR ET ORB MPS FOR LEAKAGE VAF1-90	70-012
S00L00.[illegible]	HIGH WIND ET NOSE INSPECTION SAF;0	50-018 60-012
S00U00.[illegible] (1)	POST LAUNCH SHUTTLE/PAD AREA INSPECTION SAF1-999	130-002
S00U00.[illegible] (1)	ENGR REVIEW & ANALYSIS OF LAUNCH FILM SAF1-999	150-002
S00U00.[illegible]-A (1)	AN ENGINEERING PAD INSPECTION TEAM SAF1-999	80-002
S00U00.[illegible] (1)	INSPECT ORBITER AFT ENGINE SAF1-999	50-002
S00U00.[illegible] (1)	INFRARED SURVEILLANCE SAF1-999	80-002
S00U00.[illegible] (1	PRELAUNCH SHUTTLE/PAD AREA INSPECTION SAF1-999	30-001

5.5 List of References

OPERATION 20

Reference No.	Rev	Title
NSTS 16007	(LI)	NSTS Program Launch Commit Criteria - Hazardous Gas Subsystem and Appendix F

OPERATION 30

Reference No.	Rev	Title
80901019010	(LI)	ET Post Build Acceptance and In-Process Rework Requirements Manual - Offsite

OPERATION 40

Reference No.	Rev	Title
79K24576	(LI)	OTV System Installation, LC 39, Pad A
79K24522	(LI)	OTV System Installation, LC 39, Pad B

OPERATION 50

Reference No.	Rev	Title
SPI SP-519	(LI)	OMI and OM Implementation
SFOC GO0007	(LI)	Quality Planning Requirements Document (QPRD)

OPERATION 10 Support Preparations

Shop: **STM**
Cntrl Rm Console: **FR2**
OPR: **ETM**
Zone: **NA**
Hazard (Y/N): **N**
Duration (Hrs): **0.2**

10-1 **STM** **JYVO** **138**

Verify PAD OTV system is configured to support S6444 as scheduled.

Support: COMM

10-2 **STM** **JSTC** **111**
JSTC ***SCB** **114**

Verify eight 10-minute ELSA's available at complex J for use by Final Inspection Team (ref S0007/S0014/S0037).

Support: LS

10-3 **STM** **TBC** **136**

Operation - Support Preparations complete.

*** End of Operation **10** ***

WC
150
USA

Dev. 10
P
No. 01

SEE DEV

WC
013
USA

SEP 5 01

* ENTERED

* Void 2 pl.
ETE

ET
01

ET
01

OPERATION 20 Ice Prediction Briefing

Shop: **SE**
Cntrl Rm Console: **NA**
OPR: **ETM**
Zone: **NA**
Hazard (Y/N): **N**
Duration (Hrs): **0.5**

NOTE
Ref: NSTS 16007 (LI) NSTS Program Launch Commit Criteria - Hazardous Gas Subsystem and Appendix F defines the ET No-Ice Zone.

20-1 **CICE**

Conduct L-1 day ice prediction briefing with launch director.

PH-H Signature Armando Cli 8/10/01
ARMANDO CLIN

OMRSD S00FA0.900 JSC 011 VGC

20-2 Operation - Ice Prediction Briefing complete.

*** End of Operation **20** ***

8/10/01

OPERATION 30 Pre-launch Walkdown

Shop: **SE**
Cntrl Rm Console: **NA**
OPR: **ETM**
Zone: **PAD**
Hazard (Y/N): **N**
Duration (Hrs): **2.0**

WARNING

Personnel working at heights greater than 4 feet and within 6 feet of an unguarded edge shall wear a **safety harness** with a **lanyard** secured to an approved tie off point, substantial structural member (no handrails) or a properly installed life line.

NOTE

This operation is performed at approximately L-20 hours. When this operation is performed in support of a 24 hour scrub turnaround, the preceding launch scrub post drain walkdown and this pre-launch walkdown may be performed concurrently.

Inspections may also be performed from the RSS, GO_2 Vent Arm (GVA), -Y OWP, or +Y OWP if still extended and accessible.

Ref: 80901019010 (LI) ET Post Build Acceptance and In-Process Rework Requirements Manual - Offsite

NASA ET Mechanical Engineer (PH-H) or designee shall function as team leader. Following personnel are optional walkdown participants.

NASA Engr	(4)
SFOC Engr	(2)
LMSSC - LSS	(1)
Boeing - LSS	(1)
SRB ELE	(1)
Thiokol - LSS	(1)

8/9/01

30-1 Debris inspection team **perform** walkdown of SSV and MLP per following:

1. Team leader **verify** S6444 pre-test briefing complete.

2. **Assemble** following essential personnel

   NASA PH-H Engineering - 1
   SFOC ETM Engineering - 1

3. **Inspect** following areas (as a minimum) from the MLP, RSS and FSS to identify/ resolve potential debris sources.

   Areas to be inspected

   A. Launch vehicle external surfaces

   - Orbiter
   - SRB s
   - External Tank

   B. MLP surfaces

   - LH and RH SRB holddown posts
   - Deck including deck bolts, fixtures, and edge gutters
   - SSME LH and RH SRB exhaust openings, and sound suppression (SS) troughs
   - TSM's and camera housings

4. Ref Table 30-1, **document** and SIM Photograph SSV and Launch PAD Configuration.

   Description: Pre launch walkdown.

   OMRSD S00U00.030-1

USA VM 011

8/9/01

30-2 **Record** all facility discrepancies in S0007. Submit copy to PAD leader and **notify** TBC/CTC. **Verify** no constraints to continue.

PH-H R. Richards RICHARDS Date 8/9/01

ETM Rivera Date 8/9/01

30-3 Operation - Pre-launch Walkdown complete.

ET 01

Table 30-1 Photo Requirements for SSV and Launch Pad Configuration			
Photos from MLP			
Photo	**Camera Orientation**	**Lens**	**Notes**
ET -Z	Vertical	28 mm	
Aft Dome	Horizontal	28 mm	
Aft Dome	Horizontal	35-70 mm	
LH SRB from North	Horizontal	35-70 mm	All water troughs in view
LH SRB from North	Vertical	35-70 mm	3-4 water troughs in view
LH SRB from East	Vertical	35-70 mm	
RH SRB from North	Horizontal	35-70 mm	All water troughs in view
RH SRB from North	Vertical	35-70 mm	3-4 water troughs in view
RH SRB from West	Vertical	35-70 mm	
SRB Heater Elec T-0	Horizontal	35-70 mm	Foam intrusion: May need flash
North HDP	Vertical	35-70 mm	Representative view
South HDP	Vertical	35-70 mm	Representative view
TSM T-0 LH_2	Vertical	35-70 mm	Flash needed
TSM T-0 LO_2	Vertical	35-70 mm	Flash needed
Orbiter Left & Right Wing	Vertical	35-70 mm	From below ET (1 Photo each wing)

ET 01

STEP 7C-2

STS-105 POST DRAIN SSV/MLP INSPECTION

KSC Debris Team
August 9, 2001

The post drain inspection of STS-105, MLP-3, and Pad A FSS was conducted on August 9, 2001 from 2200 to 2300 hours under dark conditions. Nevertheless, visibility was adequate for the inspection.

No MLP deck or facility anomalies were detected.

Likewise, no anomalies were observed on the SRB's.

Orbiter tiles, RCC panels, and SSME's were in nominal configuration. RCS thruster paper covers were intact.

The GOX vent arm was in the retracted position. OTV monitoring from LCC Firing Room 2 was performed prior to and during GVA retraction and had verified no anomalies with the vent system or the ET nose cone and forward LO2 tank TPS. The post detank Pad inspection also verified no anomalies in this area. No topcoat was missing from the nose cone area under the GOX vent seal footprint.

The External Tank was in excellent condition. Bipod jack pad standoff closeouts were in nominal condition. All PDL repairs were intact with none protruding. No crushed foam or debris was detected in the LO2 feedline support brackets. The stress relief crack in the -Y vertical strut forward facing TPS was still present, nut not nearly as pronounced as had been observed with LCC firing room OTV. A small area of frost was observed on the +Y longeron TPS closeout with LCC firing room OTV during de-tanking. No TPS anomaly was observed in this area during the post drain inspection (Ref. photos located in SIMS, Ice Team Bucket).

The only ice remaining was located in the LO2 feedline bellows, -Y aft fairing-to-ET/SRB cable tray interface, the lower EB fittings, and on the ET/ORB umbilical purge vents.

In summary, no IPR conditions and no flight hardware concerns were detected during the post drain inspection. There are no constraints for the next cryoload.

Jorge Rivera, NASA-KSC

135 Ft Level Photos

Photo	Camera Orientation	Lens	Notes
LO_2 UMB	Vertical	35-70 mm	From OWP usually during T5401
LH_2 UMB	Vertical	35-70 mm	From OWP usually during T5401

215 Ft Level Photos

Photo	Camera Orientation	Lens	Notes
ET surfaces from FSS	Vertical	35-70 mm	
LH SRB Frustrum and FWD skirt	Vertical	35-70 mm	
RH SRB Frustrum and FWD skirt	Vertical	35-70 mm	
Jack Pad C/O's	Horizontal	35-70 mm	Flash needed (1 each C/O)
LO_2 Ogive Cable Tray	Vertical	35-70 mm	From RSS roof

255 Ft Level Photos

Photo	Camera Orientation	Lens	Notes
ET surfaces with GO_2 vent ducts in view	Vertical	35-70 mm	
GO_2 vent ducts	Horizontal	250 mm	

****** End of Table 30-2 Photo Requirements for SSV and Launch Pad Configuration**

*** End of Operation **30** ***

OPERATION 40 Ice Frost Debris Console Initial Configuration Setup

Shop: **SE**
Cntrl Rm Console: **FR2**
OPR: **ETM**
Zone: **NA**
Hazard (Y/N): **N**
Duration (Hrs): **3.0**

> **NOTE**
> The next step sets up the photo processing laptop for use in the Firing Room. This is not a constraint to set up of the console or to final inspection team operations. Network or equipment failures on the photo processing machine shall be annotated below.

40-1 **Connect** to KSC ground ops network and **configure** laptop computer to perform photo processing/ analysis.

Notes Ready for go

> **NOTE**
> The next step verifies the setup of the infrared scanners. This is not a constraint to set up of the ice console. IR scanner condition shall be annotated below.

40-2 **Verify** IR scanner operation condition, annotate below.

RSS: NOT operational

CS 2: OK

3/16/01

NOTE

The next step verifies the operation of console monitors in the Firing Room. This is not a constraint to set up of the console or to final inspection team operations. Equipment condition shall be annotated below.

40-3 Verify console condition by powering on monitors and tape recorders.

Monitors: OK

Tape recorders: OK

NOTE

ET OTV pre-mapping/initial position of cameras may be performed in random order.

Ref: 79K24576 (LI) OTV System Installation, LC 39, Pad A and
Ref: 79K24522 (LI) OTV System Installation, LC 39, Pad B define OTV camera locations.

FOV designates field-of view. RSS and -Y OWP must be retracted for completion of pre-mapping.

Pre-mapping steps/substeps in the remainder of this operation need not be performed if supporting a scrub turnaround and if performed during a previous run.

It is preferred to record all pre-mapping scanning on a single tape. However, multiple tapes may be used when lighting/ launch countdown constraints necessitate such.

3/10/01

40-4 CVM1 JTV1 223

Perform OTV pre-mapping of External Tank exterior surfaces using OTV Cameras 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, and 067/167 as follows:

- **Insert** designated pre-map tape into trouble console VCR.
- **Punch-up** camera number on trouble monitor.
- **Start** recording on pre-map tape. **Record** start time (GMT).
- **Scan** from top-to-bottom, left-to-right and right-to-left at approximately full zoom-in.
- **Stop** recording on pre-map tape. **Record** stop time (GMT).
- **Record** data in Table 40-1.
- **Repeat** with each OTV camera listed until each has been used to scan the External Tank.
- **Remove** pre-map tape from trouble console VCR.

ETM N/A Date _____

Not Performed: [illegible]

8-10-01

40-5 CVM1 JTV1 223

Position OTV Cameras 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, 067/167, 070/170, and 071/171 to initial positions as defined in Table 40-2.

ETM R Brewer Date 8-10-01

Not Performed: N/A

8/10/01

Table 40-1 ET Pre-Mapping Data Tape #

OTV Camera	Start Time (GMT)	Stop Time (GMT)
004 / 104		
009 / 109		
013 / 113		
033 / 133		
042 / 142		
054 / 154		
055 / 155		
056 / 156		
060 / 160	N A	
061 / 161		
062 / 162		
063 / 163		
064 / 164		
065 / 165		
066 / 166		
067 / 167		

Notes: N A

8/10/01

Table 40-2 OTV Camera Initial Positions	
OTV Camera	**Initial Position**
004 / 104	FOV centered on GUCP
009 / 109	FOV on LH_2 Umbilical including ET/Orbiter interface. Vary close-up and wide angle views with 063/163 and 064/164.
013 / 113	Full zoom in. View SW GO_2 Vent Louver area.
033 / 133	FOV perpendicular to ET and with LO_2-to-Intertank splice at frame top and LH_2-to-Intertank splice at frame bottom. Then tilt down until XT2058 is in frame center.
042 / 142	FOV centered on Orbiter Access Arm-to-Orbiter interface.
054 / 154	FOV to encompass approximately 3 feet forward of XT2058 to 2 feet aft of XT2058. Orbiter wing and SRB should be in view at frame left.
055 / 155	Set FOV on north bridge LH_2 pipeline flange.
056 / 156	FOV with LH_2 Aft Dome in frame bottom and XT2058 in view at frame top.
060 / 160	Full zoom in. View SW GO_2 Vent Louver area.
061 / 161	Full zoom-in. Adjust FOV until ET LO_2-to-Intertank splice is centered vertically and view is perpendicular to ET. Pan right until edge of the ET comes into view. Note: LO_2 Tank may pass out-of-view.
062 / 162	Full zoom in. View NW GO_2 Vent Louver area.
063 / 163	FOV on LH_2 Umbilical including ET/Orbiter interface. Vary close-up and wide angle views with 009/109 and 064/164.
064 / 164	FOV on LH_2 Umbilical including ET/Orbiter interface. Vary close-up and wide angle views with 009/109 and 063/163.
065 / 165	Full zoom out. Set FOV on aft part of ET with frame bottom approximately 2 feet below LH_2 Aft Dome.
066 / 166	FOV perpendicular to ET with LO_2-to-Intertank splice at frame top. Then tilt down until Orbiter RH Wing/SRB intersection is in frame lower right.
067 / 167	Set FOV with LH_2 Aft Dome toward frame bottom and 2nd black ring of SRB in view.
070 / 170	Select down wind camera of these two as wide angle view of the SSV.
071 / 171	Set up wind camera for close-up view of SSME's.

2/10/01

40-6 Operation - Ice Frost Debris Console Initial Configuration Setup complete.

ETM _____ Date 8/10/01

*** End of Operation 40 ***

8/10/01

OPERATION 50 SSV Debris Assessment

Shop: **SE**
Cntrl Rm Console: **FR2**
OPR: **ETM**
Zone: **NA**
Hazard (Y/N): **N**
Duration (Hrs): **18.0**

> **NOTE**
> Steps in this operation are contingent upon progression of launch countdown operations and may not be performed if countdown is terminated.

Entire Operation Not Performed: N/A

> **NOTE**
> Until otherwise indicated, all times are referenced to S0007, S0014 or S0037 timelines.
>
> No operations/steps within this subtask OMI may be performed as a stand-alone procedure. This OMI may only be performed as a subtask to S0007/S0014/S0037.

> **NOTE**
> Ref: SPI SP-519 (LI) OMI and OM Implementation and Ref: SFOC GO0007 (LI) Quality Planning Requirements Document (QPRD) . following step complies with requirements for ROR-as-CMQC function.

50-1

CTIF TBC
TBC CMQC 136

Notify TBC that CTIF will perform the CMQC function for STS 105, S6444 run 2. Request TBC notify CMQC that the ROR-as-CMQC option will be exercised for STS 105, S6444 run 2.

8-1-01

50-2

CTC	TBC	232
TBC	CTIF	136

Perform OTV and ice/frost monitoring area setups.

ETM R Brewer Date 8/10/01

50-3

CTIF	TBC	136
TBC	CTC	
CTC	STM	232

Verify Operation 10- Support Preparations complete.

ETM R Brewer Date 08/10/01

50-4

CTIF

Verify Operation 20 - Ice Prediction Briefing and Operation 30- Pre-launch Walkdown complete.

ETM R Brewer Date 8/10/01

50-5

CTIF	CVM1	222
	CVM1	222

Verify:

- All OTV cameras are on, tapes in recorder, and ready to commence OTV scanning, monitoring, and recording.
- Trouble tape recorder is ready.
- Ice Frost Debris Console Initial Configuration Setup complete.

ETM R Brewer Date 8/10/01

50-6

CTIF	CICE	222
	CVM1	
	CVM2	
	CIPC	
CTIF	JYVR	138
CVM1	JTV1	223
CVM2	JTV2	225

All personnel participating in OTV operations **report** test ready status.

ETM R Brewer Date 8/10/01

Support: COMM

8/13/01

50-7

CTIF TBC 136
TBC CTC 232

Ice Frost Console Area Setups for OTV scanning complete.
Report readiness.

ETM N/A Date

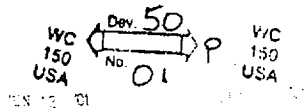
Not Performed:

8-16-01

50-8

CTIF CVM1 222

From start of LO_2 chilldown until seal deflation/GO_2 vent hood retraction, **monitor** the +Y/-Y GO_2 vent seal-to-ET interface for seal fretting and continuous GO_2 escape.



OMRS S00FB0.350-1

ETM R Brewer Date 08-10 01

Not Performed: N/A

8/10/01

NOTE
GO_2 vent seal fretting could induce damage to ET SOFI. Continuous GO_2 venting could result in formation of ice in the no ice zone (ref NSTS 16007). Ultimate decision to lift the vent hood rests with CMEC.

50-9

CTIF TBC 136
CMEC

If +Y/-Y GO_2 vent seal fretting or continuous GO_2 escape detected from start of LO_2 chilldown until seal deflation, **notify** CMEC for GO_2 vent hood removal.

ETM N/A Date N/A

Not Performed: ME 08 8-10-01

50-10

CTIF CIPC 222

Monitor wind speed and direction from start of LO_2/LH_2 chill down through launch/scrub. CIPC **notify** CTIF if winds measured at 38 knots or greater from North +/-30 degrees as measured at 60 feet.

ETM ME 08 Date 8-10-01

Not Performed: N/A

IVC 150 USA Dev. 50 01 P 8/10/01 SEE DEV

8/10/01

50-11

CTIF CVM1 222

Perform Operation 60 - Group 1 Monitoring.

ETM ME 08 Date 8-10-01

Not Performed: N/A

50-12

CTIF CVM2 222

Perform Operation 70- Group 2 Monitoring.

ETM ME 08 Date 8-10-01

Not Performed: N/A

50-13

CTIF CVM2 222

Once per hour minimum. after start of LO_2/LH_2 (until LO_2/LH_2 low level sensors read dry). **scan** LO_2 feed line brackets and flange closeouts per Table 50-1.

ETM ME 08 Date 8-10-01

Not Performed: N/A

8/10/01

50-14

CTIF CICE 222

As count proceeds, for concerns/ observations identified:

1. **Record** observation/concern on trouble tape per Table 50-1.

2. **Document** observed condition on Table 50-2, Observation Worksheet.

ETM _____ Date 8-10-01

Not Performed: N/A

50-15

TBC CTIF 136
CTIF CICE 222

Perform Operation 80 - Final Inspection when called by S0007/S0014/S0037.

ETM _____ Date 8-10-01

Not Performed: N/A

NOTE
Final SSV scan typically commences at L-2 hours.

50-16

CTIF CVM1 222
CVM2

Perform final SSV scan.

ETM_____ Date 8-10-01

Not Performed: N/A

50-17

CTIF CVM1 222
CVM2

At start of T-9 minute hold, **configure** OTV cameras for terminal count.

ETM_____ Date 8-10-01

Not Performed: N/A

50-18

WC 150 USA Dev. 50 No. 01 P WC 150 USA

If winds are from the north (+/-30 degrees) and are 38 knots ~~or greater~~ (PEAK AS MEASURED AT 60 FEET ABOVE GROUND) OR GREATER.

1. **Monitor/videotape** nose cone area during high winds.

2. **Verify:**

   A. No ice formation on the +Y and -Y GO_2 vent seal footprint areas.

   B. No damage to the ET TPS at the +Y and -Y GO_2 vent seal footprint areas.

   C. No damage to the +Y and -Y GO_2 vent seals themselves.

   D. No evidence of GO_2 leakage from +Y/-Y GO_2 vent seals to ET interface.

USA VM 011 OMRSD S00L00.150

ETM N/A Date N/A

Not Performed: 8-10-01

50-19

CTIF

Verify launch or launch scrub (drain back). **Record** data.

Launch X Scrub N/A

Date 8-10-01 GMT Time 21:10 GMT

Scrub at T- N/A

ETM ME 08 Date 8-10-01

WC 150 USA Dev. 50 No. 01 P

SEE 2/16/01 DEV

NOTE
When completely filled and drain is initiated, it takes approximately 1 hour until the LH_2 tank low level sensors read dry, and approximately 1.5 hours until the LO_2 tank low level sensors read dry.

50-20

CTIF CVM1 222
CVM2

If launch scrubbed (or drain back declared) after start of LO_2/LH_2 slow fill mode:

- **Perform** Operation 90 - LO_2/LH_2 Drain Monitoring.
- **Record** observations/concerns on trouble tape per Table 50-1.
- **Document** all observations/concerns on Table 50-2 Observation Worksheet.

ETM N/A Date N/A

Not Performed: ME 08 8-10-01

50-21 CTIF

GO_2 Vent seal to ET interface monitoring for seal fretting and continuous GO_2 escape complete.

OMRSD S00FB0.350-1

ETM ME 08 Date 8-10-01

Not Performed: N/A

8/10/01

50-22

CTIF CVM1 222
CVM2

Terminate scanning operations.

ETM BAE 08 Date 8-10-01

50-23

CTIF CVM1 222
CVM2

Perform Operation 100 - Console Securing.

ETM BAE 08 Date 8-10-01

50-24

CTIF

If LO_2/LH_2 tanking started, **perform** Operation 110 - Summary Tape.

ETM BAE 08 Date 8-10-01

Not Performed: N/A

8/10/01

NOTE
Following step may be not performed at CTIF discretion.

50-25 CTIF TBC 136
TBC STM

If Post Drain Walkdown to occur at night, **request** PAD xenon lighting be maintained/activated for duration of walkdown.

Not Performed: 8-10-01

NOTE
Post drain walkdown typically commences approximately 1.5 hours after LH_2/LO_2 low level sensors read dry.

50-26

CTIF

If launch scrubbed after start of LO_2/LH_2 tanking, **perform** Operation 120 - Post-Drain Walkdown.

ETM N/A Date* ~~8-10-01~~ NA

Not Performed: 8-10-01

50-27

CTIF

If launch occurred, **perform** Operation 130 - Post launch Walkdown.

ETM [signature] Date [illegible]

Not Performed: N/A

ET 01

8/10/01

*VOID - NA - EIE

50-28

CTIF

If launch occurred, **perform** Operation 140 - Film Review.

ETM _____ Date _____

Not Performed: N/A

50-29

SSV Debris Assessment complete.

Table 50-1 Observation Documentation Procedure

1.	CTIF	CVM1 CVM2	222	Locate anomaly/concern on pertinent OTV(s)
2.	CTIF			Punch-up pertinent OTV on trouble monitor. Update trouble tape log in table below.
3.	CTIF			Start the trouble tape.

NOTE

Trouble tape shall be allowed to run until sufficient OTV documentation of observation/concern has been made. OK to change OTV's while trouble tape is running.

4	CTIF	After observation/concern has been documented on the trouble tape, stop the trouble tape. Update trouble tape log below.

TROUBLE TAPE LOG

Trouble Tape No.	Start Time (GMT)	Stop Time (GMT)	OTV	Description
02	13:23	13:28	63,8	WATER DRIPPING FROM AFT
02	13:30	13:32	54	LOX F/L SCAN
02	13:58	13:59	061	[illegible]
02	14:25	14:34	069	LH2 F/L from 3,1
02	14:34	14:36	054	LOX F/L SCAN
02	15:44	15:45	054	LOX F/L SCAN
02	16:39	16:41	054	LOX F/L SCAN
02	17:30	17:33	054	LOX F/L SCAN
02	18:05	18:06	061	FROST BALLS ON VALLEYS
02	18:07	18:10	052	STRINGERS 3 & 4 LOX F/L SCAN

8/1/01

Table 50-1 Observation Documentation Procedure

TROUBLE TAPE LOG

Trouble Tape No.	Start Time (GMT)	Stop Time (GMT)	OTV	Description
			N/A	

*** End of Table 50-1 Observation Documentation Procedure ***

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. 1

Observed By: USA ETM

Date 8-10-01 Time ~~17:23~~ 7:23 (Tom 1521 8-10) GMT 13:23

Camera No. (or Walkdown) 63 + 8

Description:

Water Dripping from orbiter access arm.

Acceptance Rationale (or IPR/PR No.):

water is not hitting orbiter. Water is not being produced by a leak.

CICE [signature] Date 8/10/01

CTIF [signature] Date 8-10-2001

ET 01 8\10\01

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. 2

Observed By: USA ETM

Date 8-10-01 Time 9:30 GMT 13:30

Camera No. (or Walkdown) 61

Description:

3 frost spots in each of two valleys just aft of LO2/H2 splice -Z side of -Y booster.

Acceptance Rationale (or IPR/PR No.):

Frost is not in debris zone of orbiter. ~~Frost in these valleys is common on every tanking~~ [illegible]

Situation is similar to photo 2.3.8 of NSTS 08303, however frost in this case is caused by thin sanded foam.

CICE [signature] Date 8/10/01

CTIF [signature] Ken Leggett Date 8/10/2001

ET 01
8/10/01

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. 3

Observed By: [illegible]

Date 8-10-01 Time 10:25 GMT 14:25

Camera No. (or Walkdown) 009

Description:

Frost ball on LH2 F/L to LH2 tank interface

Acceptance Rationale (or IPR/PR No.):

Frost ball evaporated dissipated due to condensate run off

CICE [signature] Date 8/10/01

CTIF [signature] Date 8/10/2001

E C1 8/10/01

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. _____

Observed By: _____

Date _____ Time _____ GMT _____

Camera No. (or Walkdown) _____

Description:

_____

_____

_____

_____

Acceptance Rationale (or IPR/PR No.):

N/A

_____

_____

_____

_____

CICE _____ Date _____

CTIF _____ Date _____

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. _____

Observed By: _____

Date _____ Time _____ GMT _____

Camera No. (or Walkdown) _____

Description:

_____

_____

_____

_____

Acceptance Rationale (or IPR/PR No.: N / A

_____

_____

_____

_____

CICE _____ Date _____

CTIF _____ Date _____

2/31/01

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. _____

Observed By: _____

Date _____ Time _____ GMT _____

Camera No. (or Walkdown) _____

Description:

_____

_____

_____

_____

Acceptance Rationale (or IPR/PR No.):

N/A

_____

_____

_____

_____

CICE _____ Date _____

CTIF _____ Date _____

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. _____

Observed By: _____

Date _____ Time _____ GMT _____

Camera No. (or Walkdown) _____

Description:

_____

_____

_____

_____

Acceptance Rationale (or IPR/PR No.): N/A

_____

_____

_____

_____

CICE _____ Date _____

CTF _____ Date _____

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. _____

Observed By: _____

Date _____ Time _____ GMT _____

Camera No. (or Walkdown) _____

Description:

_____

_____

_____

_____

Acceptance Rationale (or IPR/PR No.) N/A

_____

_____

_____

CICE _____ Date _____

CTIF _____ Date _____

***** End of Table 50-2 Observation Worksheet *****

*** End of Operation **50** ***

5/31/01

OPERATION 60 Group 1 Monitoring LO2 Chill Down Thru T-0

Shop: **SE**
Cntrl Rm Console: **FR2**
OPR: **ETM**
Zone: **NA**
Hazard (Y/N): **N**
Duration (Hrs): **15.0**

NOTE

Do not perform this operation if launch scrub declared before LO_2 Chill Down commences.

Operation Not Performed: N/A

NOTE

This operation monitors LO_2 Ogive and Barrel and associated components/ areas from start of Chill Down through T-0 via OTV cameras 013/113, 060/160, 061/161, 062/162, 063/163 and 064/164.

OTV cameras 013/113 and/or 062/162 will view -Y GO_2 Vent Hood Seal at all times. At no time will both cameras be positioned away from the -Y GO_2 Vent Hood Seal.

OTV cameras 068/168 and 069/169 view SW and NE GO_2 Vent Areas respectively. These are fixed FOV cameras and do not have pan, tilt, etc. capability.

Steps in this operation are contingent upon progression of launch countdown operations and may be not performed if countdown is terminated.

Noted requirements satisfied by completion of this operation.

WC 150 USA

~~OMRS S00FB0.005-1~~

~~OMRS S00L00.150-1~~

WC 150 USA Dev 60 P AK 01

8/10/01

LO_2 Chill Down To L-2 Hour Mark

60-1 CVM1 JYVR 138

At start of vehicle LO_2 Chill Down, **start** recorders for cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163, 064/164, 068/168, and 069/169.

ETM R Brewer Date 8/10/01

Support: COMM

60-2 **Record** LO_2 MPS Chill Down start date and time (GMT).

LO_2 MPS Chill Down Date 8/10/01 GMT Time 12:24 GMT

ETM R Brewer Date 8/10/01

60-3 CVM1 JTV1 223

From start of LO_2 Chill Down until start of LO_2 Fast Fill on OTV cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163, 064/164, 068/168, and 069/169 **monitor/videotape** ET-TPS surfaces. No cryogenic liquid or excessive vapors allowed.

ETM R Brewer Date 8/10/01

Support: COMM

Not Performed: N/A

8/10/01

Table 60-1 CVM1 Camera Positions for Terminal Count

NOTE

This Table defines CVM1 camera positions for terminal countdown. Cameras should be positioned for ignition no later than pick-up of T-9 minutes count. "Spot" scanning after pick-up of the T-9 minute count is acceptable with CICE concurrence.

Cameras may be positioned for SSME ignition non-sequentially.

Camera positions may be altered real-time with CICE concurrence. Alterations should be determined prior to pick-up of T-9 minute count to allow sufficient time for operators to rehearse camera movements with ice console.

The GO_2 Vent Arm (GVA) retracts at T-2m30s.

CVM1 Camera Positions Are Defined As Follows:

004/104

GUCP centered in frame so that GUCP will stay in view throughout SRB "twang".

042/142

At approximately T-1 hour, view and monitor Orbiter access arm while Orbiter hatch is being closed.

At **T-7m30s**, watch Orbiter access arm retract, then view bipod strut in center of frame, LO_2 feedline fairing in top of frame, and Orbiter hatch in right of frame.

054/154

At **T-3m50s**, view Orbiter right hand body flap movement, then zoom out with Orbiter/ET umbilicals at approximate frame center, Orbiter trailing edge at frame bottom, and edge of +Y (RH) SRB just in view at frame right.

8/10/01

Table 60-1 CVM1 Camera Positions for Terminal Count

013/113
At **T-2m30s**, watch lift of GO_2 vent arm for debris and nose cone/vent louvers for ice damage. Immediately following lift of GO_2 vent arm, center frame on GO_2 vent louver and then zoom-out so that entire ET movement is seen during SRB 'twang' at SSME ignition.

060/160
At approximately **T-2m30s**, after GO_2 vent arm retracts, go full zoom in for a close-up inspection of the GO_2 vent louver. After CICE concurrence, go full zoom out and position camera with SSV centered and ET nose cone at frame top.

062/162
At approximately **T-2m30s**, after GO_2 vent arm retracts, go full zoom in for a close-up inspection of the -Y GO_2 vent louver. After CICE concurrence, zoom out until ET nose spike is at top of frame with ET centered.

061/161
At approximately **T-4m00s**, verify camera lights are off. Then position camera to view astronaut closing visor at T-2 minutes 00 seconds.

068/168 and 069/169
Immediately after GO2 vent hood lift, turn lights off to preclude distracting orbiter crew when the GVA rotates to its latchback position.

*** **End of Table 60-1 Camera Positions for Terminal Count** ***

*** End of Operation **60** ***

8/10/01

Terminal Count Camera Positions

NOTE

This step performed for SSME ignition only and may be not performed if launch is scrubbed prior to pick-up of T-9 minute count. Cameras must be positioned for ignition no later than T-9 minutes. "Spot" scanning after pick-up of the T-9 minute count is acceptable with CICE concurrence.

Cameras may be positioned for SSME ignition in an arbitrary order.

Camera positions may be altered real-time with CICE concurrence. Alterations should be determined prior to pick-up of T-9 minute count to allow sufficient time for OTV operators to rehearse camera movements.

CVM1 camera positions for SSME ignition are defined in Table 60-1.

60-11 **CVM1 JTV1 223**

Ref Table 60-1, **position** cameras 004/104, 013/113, 042/142, 054/154, 060/160, 062/162 for terminal count.

ETM_____ Date 8-10-01

Support: COMM

Not Performed: N/A

60-12 ~~Completion of this operation satisfies noted OMRS requirements.~~

~~OMRSD S00FB0.005-1~~
~~OMRSD S00L00.150~~

~~ETM_____ Date_____~~

60-13 Operation - Group 1 Monitoring - LO_2 Chill Down Thru T-0 complete.

8/10/01

Final SSV Inspection Scan

NOTE

Final SSV Inspection Scan should begin not later than 1.5 hours prior to start of T-9 minute hold (approximately L-2 hours) to allow ample time to finish. Final SSV Inspection Scan shall include the ET, SRB's and the Orbiter.

Final scan may be altered or partially performed in the event that time constraints will not permit a complete SSV scan prior to start of T-9 minute hold.

During Final SSV Inspection Scan the camera lights on OTV cameras 061/161 and 062/162 shall be turned "Off" when view passes over the Orbiter cockpit to preclude "distracting" the Flight Crew.

60-10 CVM1 JTV1 223

Perform Final SSV Inspection Scan with OTV cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163 and 064/164. Scan passes shall view entire SSV with cameras at approximate full zoom in during final scan.

ETM R Brewer Date 08/10/01

Not Performed: N/A

60-7 **Record** LO_2 Topping date and time (GMT).

LO_2 Topping Date 8/10/01 GMT Time 15:04 GMT

ETM R Brewer Date 8/10/01

Not Performed: N/A

60-8 **Record** LO_2 Stable Replenish mode start date and time (GMT).

LO_2 Stable Replenish Date 8/10/01 GMT Time 15:12 GMT

ETM R Brewer Date 8/10/01

Not Performed: N/A

60-9 **CVM1 JTV1 223**

From time LO_2 Stable Replenish mode is established until time for final SSV scan (approximately L-2 hours), **monitor, scan and videotape** ET-TPS surfaces on OTV cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163, 064/164, 068/168, and 069/169. No cryogenic liquid or excessive vapors allowed.

ETM R Brewer Date 8/10/01

Support: COMM

Not Performed: N/A

8/10/01

60-4 **Record** LO_2 Slow Fill start date and time (GMT).

LO_2 Slow Fill Date 08/10/01 GMT Time 12:58 GMT

ETM R Brewer Date 08/10/01

Not Performed: N/A

60-5 **Record** LO_2 Fast Fill start date and time (GMT).

LO_2 Fast Fill Date 08/10/01 GMT Time ~~13:04~~ 14:10 GMT 8-10-01

ETM R Brewer Date 08/10/01

Not Performed: N/A

60-6 **CVM1 JTV1 223**

From start of LO_2 Fast Fill until LO_2 stable replenish mode is established. **monitor/videotape** ET-TPS surfaces on OTV cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163, 064/164, 068/168, and 069/169. **Scan** LO_2 Tank. **Alternate** cameras and **scan** from Intertank to LO_2 Barrel Splice to GO_2 Vent Hood. No cryogenic liquid or excessive vapors allowed.

ETM _____ Date 8/10/01

Support: COMM

Not Performed: N/A

8/10/01

OPERATION 70 Group 2 Monitoring - LH_2 Chill Down Thru T-0

Shop: **SE**
Cntrl Rm Console: **FR2**
OPR: **ETM**
Zone: **NA**
Hazard (Y/N): **N**
Duration (Hrs): **15.0**

NOTE

Do not perform this operation if launch scrub declared before start of LH_2 Chill Down.

Operation Not Performed: N/A

NOTE

This operation monitors LH_2 Barrel and associated components/areas start of LH_2 Chill Down to pre-pressurization via OTV cameras 009/109, 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167.

Steps in this operation are contingent upon progression of launch countcown operations and may be not performed if countdown is terminated.

Noted requirements satisfied by completion of this operation.

~~OMRS S00FB0.005 1~~

~~OMRS S00FB0.360 1~~

WC 150 USA Dev. 76 No. 01 P 150 USA

8/10/01

LH_2 Chill Down To L-2 Hour Mark

70-1 CVM2 JYVR 138

At start of LH_2 Chill Down, **start** recorders for cameras 009/109, 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167.

ETM _____ Date _____

Support: COMM

70-2 **Record** LH_2 Chill Down start date and time (GMT).

LH_2 Chill Down Date 8/10/01 Time 12:10 GMT

ETM _____ Date 8/10/01

70-3 CVM2 JTV2 225

From start of propellant loading until start of LH_2 Fast Fill on OTV cameras 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167, **monitor/videotape** ET-TPS surfaces. No cryogenic liquid or excessive vapors allowed.

ETM _____ Date 8/10/01

Support: COMM

Not Performed: N/A

8/10/01

70-4 **Record** LH_2 Slow Fill start date and time (GMT).

LH_2 Slow Fill Date 8/10/01 Time 12:52 GMT

ETM Mark Wellman Date 8/10/01

Not Performed: N/A

70-5 **Record** LH_2 Fast Fill start date and time (GMT).

LH_2 Fast Fill Date 8/10/01 Time 12 58 GMT

ETM Mark Wellman Date 8/10/01

Not Performed: N/A

70-6 **CVM2 JTV2 225**

From start of LH_2 Fast Fill until stable replenish mode is established, **scan** LH_2 Tank. **Alternate** OTV cameras 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167 and **scan/videotape** from LH_2 Aft Dome to Intertank.

ETM Mark Wellman Date 8/10/01

Support: COMM

Not Performed: N/A

8/10/01

70-7

Record start date and time (GMT) for LH_2 Topping.

LH_2 Topping Date 8/16/01 Time 17:10 GMT

ETM Mark Wetherington Date 8/16/01

Not Performed: N/A

70-8 **Record** LH_2 Stable Replenish mode start date and time (GMT).

LH_2 Stable Replenish Date 8/16/01 Time 17:10 GMT

ETM Mark Wetherington Date 8/16/01

Not Performed: N/A

70-9 **CVM2 JTV2 225**

During LH_2 Stable Replenish mode and until time for final scan (approximately L-1.5 hours), on OTV cameras 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167, **monitor/videotape** ET TPS surfaces including LO_2 Feed Line, LH_2 Feed Line, LH_2 Recirculation Line, LH_2 Aft Dome and manhole covers, LH_2/LO_2 Umbilicals, and TSM LH_2/LO_2 Umbilicals. No cryogenic liquid or excessive vapors allowed.

ETM Mark Wetherington Date 8/16/01

Support: COMM

Not Performed: N/A

Final SSV Inspection Scan

NOTE
Final SSV Inspection Scan should begin not later than 1.5 hours prior to start of T-9 minute hold (approximately L-2 hours) to allow ample time to finish. Final SSV Inspection Scan shall include the ET, SRB's and the Orbiter. Final SSV Inspection Scan may be altered or partially performed in the event that time constraints will not permit a complete SSV scan prior to start of T-9 minute hold.

70-10 **CVM2** **JTV2** **225**

Perform Final SSV Inspection Scan with OTV cameras 009/109, 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 064/164. Scan passes shall view entire SSV with cameras at full zoom in during final scan.

ETM Tom Ford Date 8-10-01

Support: COMM

Not Performed: N/A

8/10/01

T-9 Minute Terminal Count

NOTE

Next step performed for terminal count only and may be not performed if launch is scrubbed prior to pick-up of T-9 minute terminal count. Cameras must be positioned for SSME ignition no later than T-9 minutes. 'Spot' scanning after pick-up of the T-9 minute terminal count is acceptable with CICE concurrence.

Cameras may be positioned for SSME ignition in an arbitrary order.

Camera positions may be altered real-time with CICE concurrence. Alterations should be determined prior to pick-up of T-9 minute count to allow sufficient time for OTV operators to rehearse camera movements.

CVM2 camera positions for terminal count are defined in Table 70-1.

70-11 CVM2 JTV2 225

Ref Table 70-1, **position** cameras 009/109, 033/133, 056/156, 065/165, 066/166 061/161, 070/170, 071/171 and 067/167 for terminal count.

ETM Tom Ford Date 8 10 01

Support: COMM

Not Performed: N/A

70-12 ~~Completion of this operation satisfies noted OMRS requirements.~~

WC 150 USA Dev 70 No 01 P WC 150 USA

~~OMRSD S00FB0.005-1~~

~~OMRSD S00FB0.360-1~~

~~ETM Date~~

70-13 Operation - Group 2 Monitoring - LH_2 Chill Down Thru T-0 complete.

8/10/01

Table 70-1 - CVM2 Camera Positions for Terminal Count

NOTE

This Table defines CVM2 camera positions for terminal countdown. Cameras should be positioned for ignition no later than pick-up of T-9 minutes count. "Spot" scanning after pick-up of the T-9 minute count is acceptable with CICE concurrence.

The Orbiter access arm (OAA) retracts at T-7M30S. Orbiter body flap movement occurs at T-3m50s.

Cameras may be positioned for SSME ignition non-sequentially

Camera positions may be altered real-time with CICE concurrence. Alterations should be determined prior to pick-up of T-9 minute count to allow sufficient time for operators to rehearse camera movements with ice console.

8/10/01

Group 2 Camera Positions Are Defined As Follows:

033/133
Full zoom out. LO_2 feed line in frame center and MLP deck at bottom.

055/155
View ET aft dome with MLP deck just out of view at bottom, ET XT-2058 ring frame at frame top and both SRB's just in view at sides.

056/156
View ET aft dome with MLP deck just out of view at bottom. ET XT-2058 ring frame at frame top and both SRB's just in view at sides.

065/165
Full zoom out. SSV centered. MLP deck edge just in view at bottom.

066/166
ET centered. Intertank to LO_2 Barrel splice at frame top with the majority of Orbiter wing in view.

067/167
Center on GUCP for optimum view.

070/170 and 071/171
At **T-9m00s**. zoom in on space shuttle main engine with camera providing best view. Zoom out on SSME for wide angle view with other camera.

009/109
At approximately **T-3m50s**. position to view Orbiter body flap and elevons movement. Afterwards. center on LH_2 umbilical with -Y vertical strut at frame top.

061/161
At approximately **T-1m30s**. tilt-up to GO_2 Vent Footprint. Zoom in. Pause. If footprint is acceptable. zoom out and tilt down to view Orbiter nose/cockpit through liftoff.

*** End of Table 70-1 - CVM2 Camera Positions for Terminal Count ***

*** End of Operation **70** ***

8/10/01

OPERATION 80 Final Inspection

Shop: **SE**
Cntrl Rm Console: **FR2**
OPR: **ETM**
Zone: **PAD A/B**
Hazard (Y/N): **Y**
Duration (Hrs): **3.0**

NOTE

Final Inspection may not need to be performed depending on LO_2/LH_2 tanking and launch countdown, as determined by CTC/TTL.

Final Inspection Team stay time guidelines for each level are given in Table 80-1. These guidelines are for reference only and may be deviated from at PICE discretion.

Operation Not Performed: N/A

8/10/01

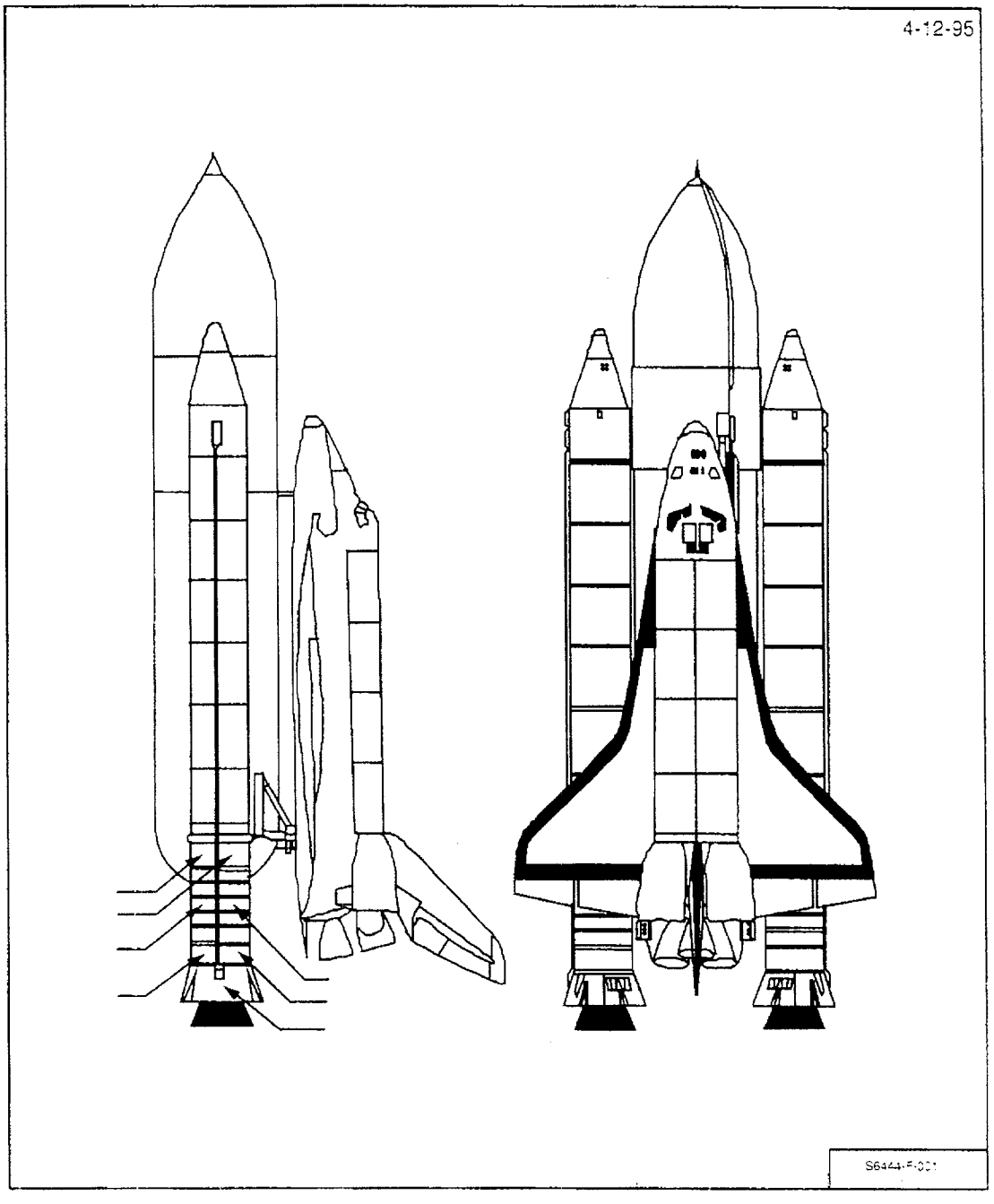


Figure 80-1: Deck (0) Level
(For Reference Only)

8/10/01

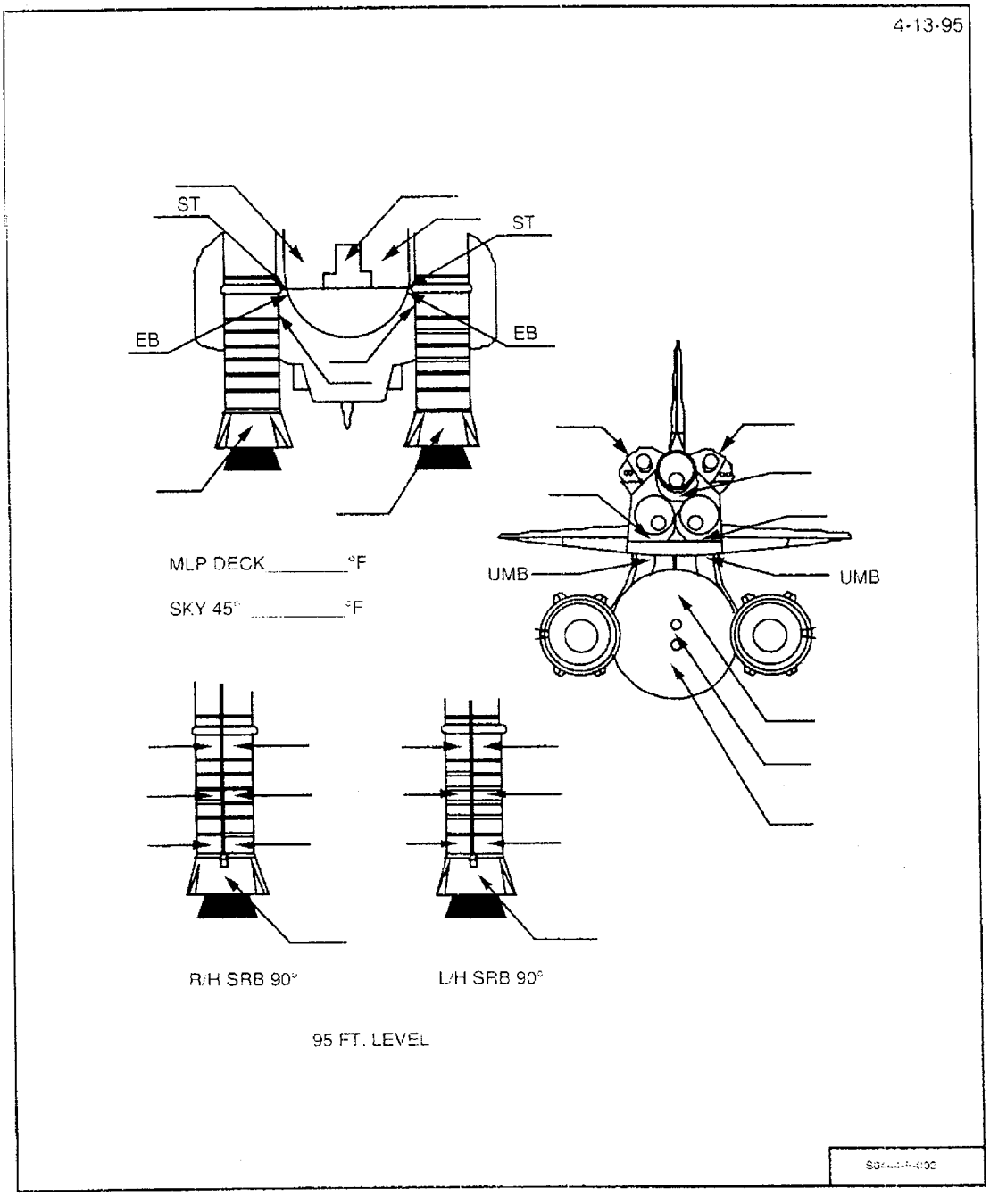


Figure 80-2: Deck (0) and 95 Ft Levels
(For Reference Only)

8/10/01

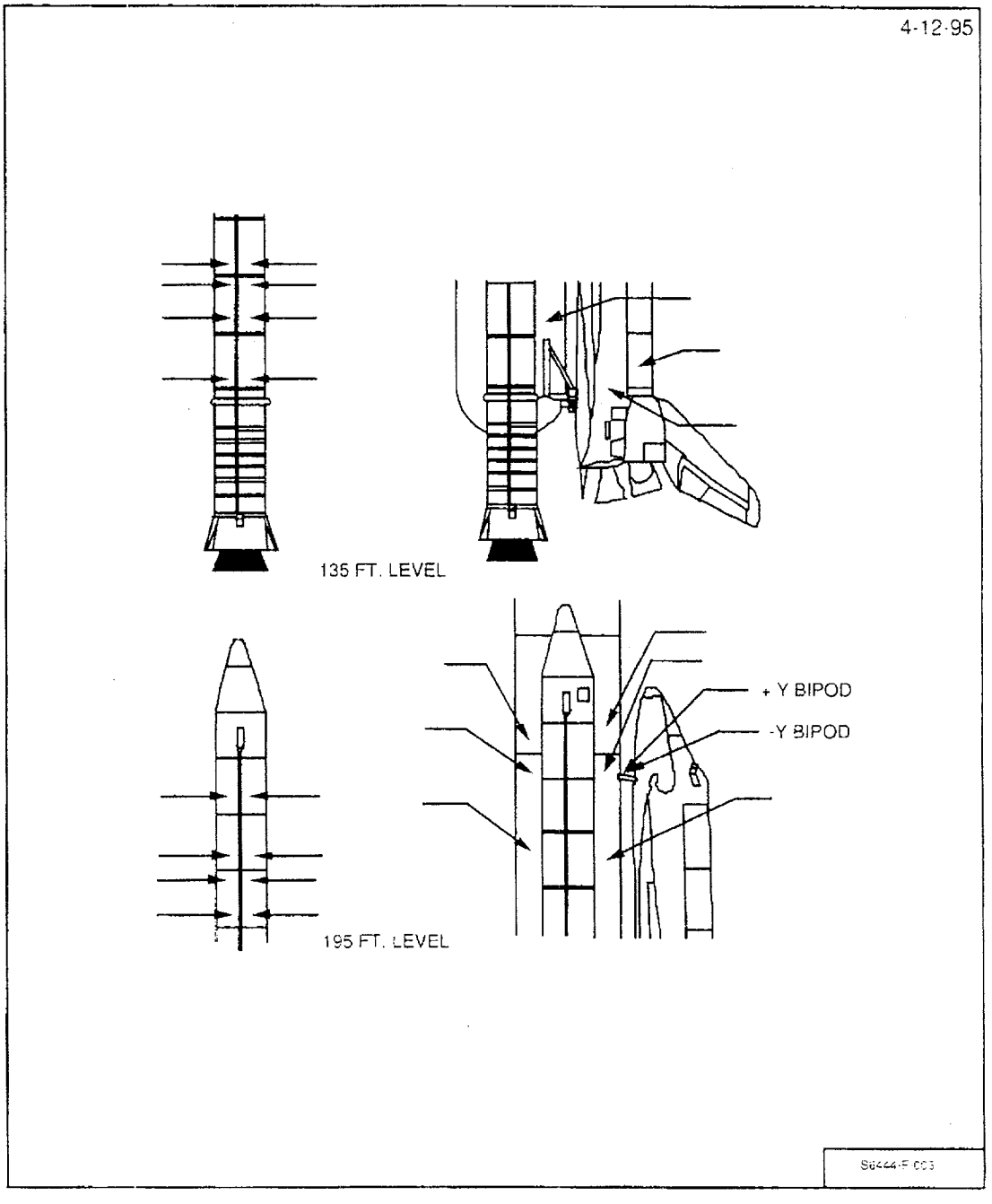


Figure 80-3: 135 and 195 Ft Levels
(For Reference Only)

8/10/01

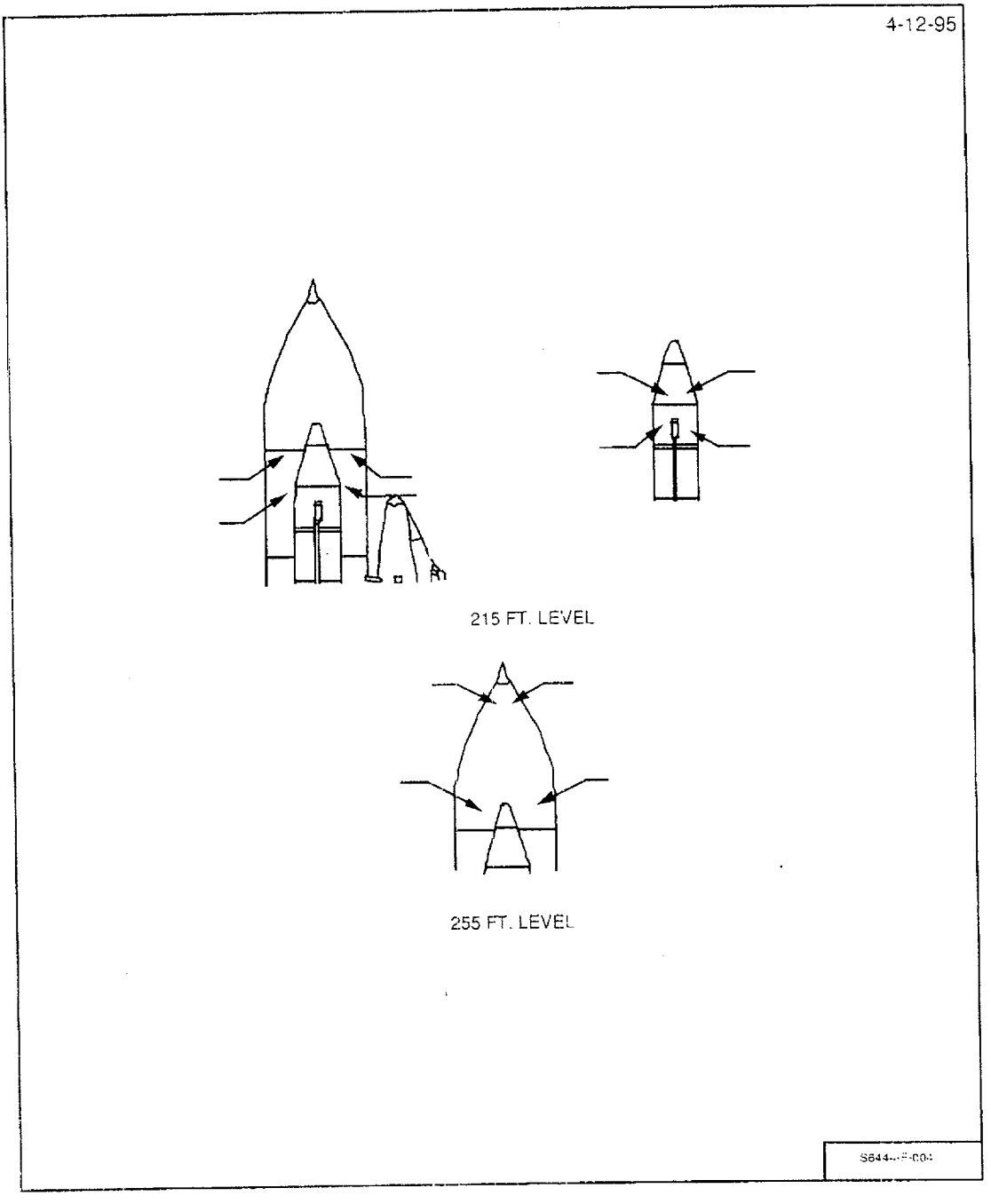


Figure 80-4: 215 and 255 Ft Levels
(For Reference Only)

8/10/01

WARNING

Personnel working at heights greater than 4 feet and within 6 feet of an unguarded edge shall wear a **safety harness** with a **lanyard** secured to an approved tie off point, substantial structural member (no handrails) or a properly installed life line.

WARNING

Personnel performing final inspection shall be attired in **Nomex coveralls with gloves and hoods .** Personnel shall have available gloves, hoods, and **ELSA** at all times during walkdown.

Personnel using Sony DKC-ID1 camera shall verify lithium ion battery is securely locked in bayonet connector and the lithium button battery door is locked and taped in place. Personnel shall ensure the flash is not activated on the camera.

Personnel using Kodak DC-50/120 shall verify alkaline batteries are properly installed and the flash is not active on the camera.

Personnel using digital cameras (Sony DKC ID1, Kodak DC-50/120 shall not use these cameras in the presence of a hydrogen leak or an oxygen enriched atmosphere (readings greater than 23 percent O_2).

NOTE

Task Team Leader (TTL) for final inspection is PH-H. Additional personnel (listed below) may be added to the final inspection team with CTC, Launch Director, and Safety concurrence.

JSC Level II	(1)
PH-H	(2)
SFOC ETM	(1)

8/10/01

80-1 **Assemble** following final inspection team members:

TTL - PH-H	(1)
PH-H	(1)
SFOC ETM	(2)
LMSSC LSS	(1)
SFOC Safety	(1)

80-2 Final inspection team **perform** walkdown of SSV and associated facilities as follows: @ 35 mm - Photos may be not performed with TTL Concurrence.

NOTE

Tables 80-2 and 80-3 are reference only items. Images are to be taken of targets of opportunity. Images must be taken with 35 mm and digital cameras. Digital images shall be inputted into SIMS.

1. Ref Tables 80-2 and 80-3, photograph SSV points of opportunity during final inspection using 35 mm. **Record** data.

Roll No. N/A

Negative No. N/A

Work order No. N/A

@ 35 mm Not Performed 2/16/01 10 13

2. Reference Tables 80-2 and 80-3. **take** digital image of SSV points of opportunity using digital camera.

Description: Final Inspection Team

3. See Figures 80-1 through 80-4. **measure and record** (deg F) SSV external surface temperatures using IR gun(s)/scanners.

2/16/01

NOTE

The following substep references inspection areas. However, inspection shall not be limited to these areas. Inspection shall be of entire SSV and specific areas of concern as defined by the TTL, CTC, or Launch Director.

4. **Visually inspect:**

- Orbiter aft engine compartment external surfaces for condensation and ice formations.
- ET TPS surfaces which cannot be observed by the OTV system.
- Specific areas of concern as determined by the TTL, CTC, or Launch Director.

OMRSD S00U00.020-A-1

OMRSD S00U00.020-C-1

OMRSD S00U00.020-D-1

80-3 Final Inspection complete. **Verify** no constraints to continue.

TTL (PH-H) _____ Date 8/10/01

SFOC-ETM _____ Date 8.10.01

80-4 Operation - Final Inspection complete.

ETM _____ Date 8-10-01

8/10/01

Table 80-1 **Final Inspection Team Walkdown Stay Times**

255 Ft Level - 5 Minutes

- LO_2 Ogive and Barrel acreage
- GO_2 Pressurization Line
- LO_2 Tank Cable Tray
- Visible LH SRB surfaces
- GO_2 Vent Ducts

215 Ft Level - 20 Minutes

- ET GH_2 7 inch Vent Assembly
- ET acreage (between -Z and -Y axis)
- GO_2 vent area
- Orbiter tiles
- Visible SRB surfaces
- Inter tank-to-LO_2 Barrel splice

195 Ft Level - 10 Minutes

- LO_2 Feed Line
- ET/Orbiter Bipods (side and bottom view)
- -Y ET/SRB forward attachment (bottom view)
- -Y ET/SRB aft attachments (top view)
- Inter tank splice areas (LO_2 and LH_2)
- ET acreage (between -Y and +Z axis)
- Orbiter tiles
- Visible LH SRB surfaces

135 Ft Level - 10 Minutes

- LH_2 ET/Orbiter Umbilical
- -Y ET/SRB C/T
- -Y Vertical Strut
- LO_2 Feed Line
- ET acreage between -Y axis and +Z axis
- ET/Orbiter attachments (top view)
- Visible LH SRB surfaces
- Orbiter aft fuselage

8/10/01

Table 80-1 Final Inspection Team Walkdown Stay Times

0 Level - 30 Minutes

- LH_2 Aft Dome
- ET acreage around +Z axis
- ET acreage around -Z axis
- LO_2 Feed Line
- LH_2 Feed Line
- ET/Orbiter attachments - Bottom view
- ET/Orbiter LH_2 and LO_2 Umbilicals
- T-0 LH_2 and LO_2 Umbilicals
- Space Shuttle Main Engines (SSME)
- Orbiter tiles
- ET/SRB aft attachments
- Visible SRB surfaces
- SRB ignition overpressure sound suppression water troughs

*** End of Table 80-1- Final Inspection Team Walkdown Stay Times ***

Table 80-2 Final Inspection Team - Telephotos

TELEPHOTOS - 255 FT LVL

Photo	Camera Orientation	Notes
GO_2 Vent Ducts	Horizontal	
LO_2 Acreage	Vertical	

TELEPHOTOS - 215 FT LVL

Photo	Camera Orientation	Notes
-Y Bipod Ramp	Horizontal	From RSS
LO_2 P/L Ice Frost Ramps	Vertical	From RSS; Requires 3-4 shots
GO_2 Seal/Hood	Horizontal	From haunch & RSS
GUCP	Vertical	

TELEPHOTOS - 195 FT LVL

Photo	Camera Orientation	Notes
-Y Bipod Ramp & Jack PAD C/O	Horizontal	

TELEPHOTOS - 135 FT LVL

Photo	Camera Orientation	Notes
LH_2 UMB	Horizontal	
-Y Longeron	Vertical	If needed
Jack Pad Closeouts	Horizontal	
LH_2 Acreage	Vertical	

8/10/01

Table 80-2 Final Inspection Team - Telephotos

TELEPHOTOS - MLP

Photo	Camera Orientation	Notes
LH_2 UMB	Horizontal	From West
LH_2 UMB	Horizontal	From NW
EB-7	Horizontal	
EB-8	Horizontal	
LH_2 Aft Dome	Horizontal	
Third Hard Point C/O	Vertical	
LH_2 Barrel	Horizontal	From North
SSV Overall	Horizontal	From North
SSV Overall	Horizontal	From East
LO_2 F/L Bracket & Bellows	Vertical	XT-1973
LO_2 F/L Bracket	Vertical	XT-1871
LO_2 F/L Bracket	Vertical	XT-1623
LO_2 F/L Bracket	Vertical	ST-1377 & XT-1129
LO_2 F/L Bracket & Bellows	Vertical	XT-1129 & XT-1106 from SE
LO_2 P/L & C/T	Vertical	From SE

600 MM PHOTOS - 255 FT LVL

Photo	Shutter Speed	Notes
GO_2 Vent Ducts	1/30	Contingency

8/10/01

Table 80-2 **Final Inspection Team - Telephotos**

600 MM PHOTOS - 215 FT LVL

Photo	Shutter Speed	Notes
-Y GO_2 Seal	1/30	
-Y Bipod Ramp	1/30	Contingency
Jack Pad C/O's	1/4	Difficult if windy
LO_2 F/L	1/15	
-Y Vertical Strut (Crack)	1/30	

600 MM PHOTOS - 195 FT LVL

Photo	Shutter Speed	Notes
-Y Bipod Ramp	1/30	Contingency

600 MM PHOTOS - 135 FT LVL

Photo	Shutter Speed	Notes
LH_2 UMB	1/30	
-Y Vertical Strut (Crack)	1/60	
LO_2 F/L Bellows	1/15	Contingency

8/10/01

Table 80-2 Final Inspection Team - Telephotos

600 MM PHOTOS - MLP

Photo	Shutter Speed	Notes
LH_2 UMB	1/30	From West
LH_2 UMB	1/30	From NW
LH_2 UMB	1/30	From East
LH_2 UMB Actuator C/O	1/15 or 1/30	From North standing next to water pipe
LO_2 UMB	1/5	Lower Inboard
LO_2 UMB	1/8	Inboard
LO_2 F/L Bracket & Bellows	1/15	One photo to include XT-1978 & XT-1973
LO_2 F/L Bracket	1/15	XT-1871
LO_2 F/L Bracket	1/15	XT-1623
LO_2 F/L Bracket	1/15	XT-1377
LO_2 F/L Bracket	1/30	One photo to include XT-1129 & XT-1106
LO_2 F/L Bracket	1/30	From SE corner; One photo to include XT-1129 & XT-1106
Jack Pad C/O's	1/15	From SE corner
Ice Frost Ramps or Pal Ramps	1/15 or 1/30	Contingency
LH_2 UMB Inboard	1/15	From East
+Y Longeron	1/15 or 1/30	Contingency
-Y Longeron	1/15	Contingency

8/10/01

Table 80-2 Final Inspection Team - Telephotos

WIDE ANGLE PHOTOS - 255 FT LVL

Photo	Camera Orientation	Lens	Notes
LO_2 Tank	Vertical	35-70 mm	
GO_2 Vent Ducts	Horizontal	35-70 mm	

WIDE ANGLE PHOTOS - 215 FT LVL

Photo	Camera Orientation	Lens	Notes
Overall GH_2 Vent Line	Horizontal	35-70 mm	
Orbiter Nose, ET -Y Side	Horizontal	35-70 mm	
Orbiter Nose, ET -Y, +Z Side	Horizontal	35-70 mm	From RSS
Forward Half of Vehicle	Vertical	28 mm	From RSS
Entire Orbiter	Vertical	28 mm	From RSS

WIDE ANGLE PHOTOS - 195 FT LVL

Photo	Camera Orientation	Lens	Notes
Aft Part of SSV, LH Wing	Vertical	35-70 mm	
Orbiter Fwd Section, Upper LH_2 Tank	Vertical	35-70 mm	
Bipod, -Y, +Z Intertank Area	Horizontal	35-70 mm	

8/10/01

Table 80-2 Final Inspection Team - Telephotos

WIDE ANGLE PHOTOS - 135 FT LVL

Photo	Camera Orientation	Lens	Notes
Orbiter Aft Section	Vertical	35-70 mm	
Lower LH_2 Tank & LH SRB	Vertical	35-70 mm	

WIDE ANGLE PHOTOS - MLP

Photo	Camera Orientation	Lens	Notes
Overall Orbiter Left Side	Vertical	28 mm	
ET -Y, +Z Quadrant	Vertical	28 mm	
ET -Z Side	Vertical	28 mm	
ET +Y, +Z Quadrant	Vertical	28 mm	
Overall Orbiter Right Side	Vertical	28 mm	
ET Aft Dome	Horizontal	35-70 mm	
-Z Side of LO_2 T-0; RCS Stinger	Horizontal	35-70 mm	
+Z Side of LO_2 T-0; RCS Stinger OMS Nozzle	Horizontal	35-70 mm	
-Z Side of LH_2 T-0; RCS Stinger	Horizontal	35-70 mm	
+Z Side of LH_2 T-0; RCS Stinger OMS Nozzle	Horizontal	35-70 mm	
Overall SSME Cluster	Horizontal	50 mm	-Y Side
SSME No. 2	Horizontal	50 mm	
SSME No. 1, -Z Side	Horizontal	50 mm	
SSME No. 3	Horizontal	50 mm	

8/10/01

Table 80-2 Final Inspection Team - Telephotos

Overall SSME Cluster	Horizontal	50 mm	+Y Side
LO_2 UMB Area	Horizontal	35-70 mm	
LH_2 UMB Area	Horizontal	35-70 mm	
ET/ORB UMB & ORB Lower Surface	Horizontal	28 mm	From under ET

*** End of Table 80-2 Final Inspection Team - Telephotos ***

8/10/01

Table 80-3 Reduced Final Inspection Team Photos

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - 255 FT LVL

Photo	Camera Orientation	Lens	Notes
GO_2 Vent Ducts	TELE	Horizontal	

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - 215 FT LVL

Photo	Camera Orientation	Lens	Notes
-Y Bipod Ramp	Horizontal	TELE	From RSS
LO_2 P/L Ice/Frost Ramps	Vertical	TELE	From RSS; 2 photos required
GO_2 Seal/Hood	Horizontal	TELE	From RSS
GUCP	Vertical	TELE	
Fwd Half of SSV	Vertical	28 mm	From RSS
Entire Orbiter	Vertical	28 mm	From RSS

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - 195 FT LVL

Photo	Camera Orientation	Lens	Notes
-Y Bipod Ramp & Jack Pad C/O's	Horizontal	TELE	

8/10/01

Table 80-3 Reduced Final Inspection Team Photos

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - 135 FT LVL

Photo	Camera Orientation	Lens	Notes
LH_2 UMB	Horizontal	TELE	
Orbiter Aft Section	Vertical	35-70 mm	

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - MLP DECK

Photo	Camera Orientation	Lens	Notes
LH_2 UMB	Horizontal	TELE	From West
ET Aft Dome	Horizontal	TELE	
Aft Hard Point Closeout	Vertical	TELE	
LH_2 Tank	Horizontal	TELE	From North
LO_2 Tank	Horizontal	TELE	From North
LO_2 Tank	Horizontal	TELE	From East
LO_2 F/L Bracket Bellows	Horizontal	TELE	XT - 1978 & XT - 1973
LO_2 F/L Bracket	Horizontal	TELE	XT - 1871
LO_2 F/L Bracket	Horizontal	TELE	XT - 1623
LO_2 F/L Brackets	Horizontal	TELE	XT - 1377 & XT - 1129
LO_2 F/L Brackets & Bellows	Horizontal	TELE	XT - 1129 & XT - 1108; from SE
LO_2 P/L & C/T	Horizontal	TELE	From SE
Overall Orbiter Left Side	Vertical	28 mm	
ET -Z Side	Vertical	28 mm	
Overall Orbiter Right Side	Vertical	28 mm	
Overall SSME Cluster -Y Side	Horizontal	28 mm	

Table 80-3 Reduced Fin Inspection Team Photos

Overall SSME Cluster +Y Side	Horizontal	28 mm	
ET/Orb UMB & Orbiter Lower Surface	Horizontal	28 mm	From under ET

*** End of Table 80-3 - Reduced Final Inspection Team Photos ***
*** End of Operation **80** ***

8/10/01

OPERATION 90 LO_2/LH_2 Drain Monitoring

Shop: **SE**
Cntrl Rm Console: **FR2**
OPR: **ETM**
Zone: **NA**
Hazard (Y/N): **N**
Duration (Hrs): **4.0**

NOTE

This operation is contingent upon progression of launch countdown and is performed after start of cryo (LO_2/LH_2) loading and subsequent launch scrub, FRF, or WCDDT.

Operation Not Performed: ETE OB 8-10-01

NOTE

This operation monitors the External Tank external surfaces during LO_2/LH_2 drain operations from time of detanking until 1.5 hours after LO_2/LH_2 low level sensors read dry via OTV 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, 067/167, 068/168, 069/169, 070/170, and 071/171.

Noted requirements satisfied by this operation: OMRS S00E00.021

90-1 **Record** start date/time (GMT) of LH_2 and LO_2 Tank Drain.

LH_2 Drain Start Date N/A Time N/A GMT

LO_2 Drain Start Date N/A Time N/A GMT

ETM N/A Date N/A

8/10/01

90-2 CVM1 JTV1 223

From start of LO_2 Tank Drain and LH_2 Tank Drain until respective LO_2/LH_2 ow level sensors read dry, **monitor** ET external surfaces including LO_2 Feed Line. LH_2 Feed Line. LH_2 Recirculation Line, LH_2 Aft Dome and manhole covers. LH_2/LO_2 Umbilicals. TSM LH_2/LO_2 Umbilicals via OTV cameras. No cryogenic liquid or excessive vapors allowed.

ETM N/A Date N/A

Support: COMM

90-3 **Record** date/time (GMT) when LO_2/LH_2 low level sensors read dry.

LH_2 Sensors Dry Date N/A Time N/A GMT

LO_2 Sensors Dry Date N/A Time N/A GMT

ETM N/A Date N/A

8/10/01

90-4 CVM1 JTV1 223

Monitor ET external surfaces including LO_2 Feed Line, LH_2 Feed Line, LH_2 Recirculation Line, LH_2 Aft Dome and manhole covers, LH_2/LO_2 Umbilicals, TSM LH_2/LO_2 Umbilicals via OTV cameras for 1.5 hours after LO_2/LH_2 low level sensors have read dry. No cryogenic liquid or excessive vapors allowed. Record date/time (GMT) when monitoring complete.

LH_2 Complete Date N/A Time N/A GMT

LO_2 Complete Date N/A Time N/A GMT

ETM N/A Date N/A

Support: COMM

90-5 Completion of this operation satisfies noted requirements.

USA VM 067 OMRSD S00E00.021

90-6 Operation - LO_2/LH_2 Drain Monitoring complete.

*** End of Operation **90** ***

8/10/01

OPERATION 100 Console Securing

Shop: **SE**
Cntrl Rm Console: **FR2**
OPR: **ETM**
Zone: **NA**
Hazard (Y/N): **N**
Duration (Hrs): **0.5**

100-1

CTIF TBC 136
TBC CTC 232

OTV support for ET thermal protection system evaluation no longer required.

100-2

CTIF JYVR 138

Perform the following:

1. **Turn off** video recorders.
2. **Remove** tape cartridges.
3. OTV support no longer required.

Support: COMM

100-3

CTIF CVM1 222
CVM2

Secure consoles by setting all monitors to "Off" position.
Report completion.

8/10/01

NOTE
Perform next step only after a successful launch.

100-4

CTIF

Remove photo processing laptop computer from Firing Room.

Not Performed: N/A

100-5

CTIF	**TBC**	**136**
TBC	**CTC**	**232**

Firing Room 2, ice frost monitoring area securing complete.

100-6

Operation 100 - Console Securing complete.

ETM R. Seale Date 8/14/01

*** End of Operation **100** ***

8/14/01

OPERATION 110 Summary Tape

Shop: **SE**
Cntrl Rm Console: **FR2**
OPR: **ETM**
Zone: **NA**
Hazard (Y/N): **N**
Duration (Hrs): **18.0**

NOTE
Observations/concerns observed during count are typically recorded on the summary tape real-time (trouble tape).

110-1 **CICE**

After launch or launch scrub, prepare a summary tape to include observations/concerns noted during count.

110-2 Operation Summary Tape complete.

ETM R. Seale Date 8/10/01

*** End of Operation **110** ***

OPERATION 120 Post Drain Walkdown

Shop: **SE**
Cntrl Rm Console: **NA**
OPR: **ETM**
Zone: **PAD A/B**
Hazard (Y/N): **Y**
Duration (Hrs): **2.0**

NOTE

Post drain walkdown performed only after start of cryo (LH_2/LO_2) loading and subsequent launch scrub.

Operation Not Performed: 8-10-01

WARNING

Personnel working at heights greater than 4 feet and within 6 feet of an unguarded edge shall wear a **safety harness** with a **lanyard** secured to an approved tie off point, substantial structural member (no handrails) or a properly installed life line.

Personnel shall wear **hardhats** and **flame retardant coveralls** while performing post drain walkdown.

NOTE

Post drain walkdown typically commences approximately 1.5 hours after LH_2/LO_2 low level sensors read dry.

Post drain walkdown performed in support of a 24 hour scrub turnaround is typically coincident with the L-20 hour pre-launch walkdown for the ensuing launch attempt.

8/10/01

NOTE
NASA ET Mechanical Engineer (PH-H) or designee shall function as team leader. Following personnel are walkdown optional participants:
NASA Engr (4)
SFOC Engr (2)
LMSSC-LSS (1)
Boeing LSS (1)
SFOC Safety (1)

120-1 NASA Lead ET Mechanical Systems Engineer (PH-H) verify essential personnel on station, properly attired, and ready to proceed with post drain walkdown.

Essential Personnel	
NASA Engineering (PH-H)	1
SFOC Engineering (ETM)	1

NOTE
"Hands-on Investigation" is applicable only to those areas which are not understood or fully defined and which cannot be adequately evaluated otherwise.

120-2 **Perform** post drain walkdown as follows:

1. **Visually inspect** ET TPS exterior surfaces after detanking and warm-up (approximately T + 4 hours after drain is initiated) from the MLP, FSS, and RSS as access permits.

2. **Perform** hands-on investigation of all areas suspected of violating Doc: NSTS 08303 (LI) NSTS PROGRAM ICE/DEBRIS INSPECTION CRITERIA (LI)

USA VM 067 OMRSD S00E00.031

8/10/01

120-3 Walkdown complete. All discrepancies identified. No constraints to continue.

PH-H N/A Date N/A

ETM N/A Date N/A

120-4 Operation Post Drain Walkdown complete.

*** End of Operation **120** ***

OPERATION 130 Post Launch Walkdown

Shop: **SE**
Cntrl Rm Console: **NA**
OPR: **ETM**
Zone: **PAD A/B**
Hazard (Y/N): **Y**
Duration (Hrs): **3.0**

NOTE

Do not perform this operation after launch scrub.

Operation Not Performed: N/A

WARNING

Personnel working at heights greater than 4 feet and within 6 feet of an unguarded edge shall wear a **safety harness** with a **lanyard** secured to an approved tie off point, substantial structural member (no handrails) or a properly installed life line.

Personnel participating in walkdown shall wear **hardhats** and **flame retardant coveralls .**

NOTE

NASA ET Mechanical Engineer (PH-H) or designee shall function as team leader. Following personnel are walkdown optional participants:

NASA Engr	(3)
SFOC Engr	(2)
LMSSC-LSS	(1)
Boeing LSS	(2)
SRB ELE	(1)
Thiokol-LSS	(1)
SFOC Safety	(1)

130-1 NASA (PH-H) **verify** following personnel on station, properly attired, and ready to proceed with post launch walkdown.

WC 150 USA

Dev. 130 No. 01 P 8\10\01 SEE DEV

Essential Personnel		
NASA	PH-H	1
SFOC	ETM	1

130-2 **Perform** Post Launch Walkdown as follows:

1. Ref Table 130-1, **visually inspect** post launch pad/area to identify any lost flight or ground systems hardware and debris sources.

2. Ref Table 130-2, **document/SIMS photograph** launch PAD area configuration.

Description: Post Launch Walkdown

OMRSD S00U00.010-1

130-3 Walkdown complete. Debris sources and lost flight hardware identified. No constraints to continue.

PH-H [signature] Date 8\10\01

ETM [signature] Date 8\10\01

130-4 Operation - Post Launch Walkdown complete.

ET 01 8\10\01

Table 130-1 Post Launch Walkdown Inspection Areas

SEE "STS 105 POST LAUNCH PAD DEBRIS INSPECTION REPORT" INSERT AT STEP 1580-1.

Record mission info, PAD, date, and time:

STS _____ PAD _____

Date _____ Time _____

D. Spence ET 8/14/01

SRB Hold-down posts (HDP)

Inspect for damage, stud hang-up Epon shim material, ordnance fragments, doghouse blast covers, erosion, missing hardware, debris. Record Results:

N/A

MLP Deck

SRB aft skirt purge lines
SRB T-0 umbilicals
Tail service masts (TSM's)
MLP deck

195 Ft Level

Orbiter access arm (OAA)

ET C1 8/14/01

Table 130-1 Post Launch Walkdown Inspection Areas

215 Ft Level - GH2 Vent Line/GUCP

Latch position
Loose cables
Damage from SRB plume
Damage to the QD

255 Ft Level - GO_2 Vent Arm, Ducts, Hood

Seals
Hood windows, doors, latches

Fixed Service Structure (FSS)

Cable tray covers
Signs
Hydraulic leaks
Slidewire baskets

PAD Apron/Acreage

Vehicle hardware and/or flight TPS materials
Facility debris

Table K-1 PAD Apron/Acreage Items

Description	Location

*** End of Table 130-1 - Post Launch Walkdown Inspection Areas ***

8/14/01

Table 130-2 Post Launch Photos (MLP, FSS, PAD, Apron, Pad Acreage)

MLP 0-level

1 Ea HDP No. 1, 2, 5 & 6 (HDP shoe and Epon shim)
1 Ea HDP No. 3, 4, 7 & 8 (blast cover down to HDP base)
1 Ea SRB T-O umbilical
1 Ea overall view SRB exhaust cutouts\

Any unusual or debris-related damage to the facility; sound suppression water pipes, TSM's cracks in MLP deck, witness panels, handrails, etc.

Any flight hardware debris (tiles, SRB ordnance fragments)
Any facility debris (nuts, bolts, cable tray covers, etc.)

FSS

Close-ups of GUCP and latching mechanism
Overall views of GO_2 vent hood/ducts, if damaged
Any flight hardware or facility debris
Any unusual or debris-related damage to the facility

PAD Apron/PAD Acreage

Any flight hardware or unusual facility debris objects

Any unusual or debris-related damage to the PAD (such as missing brick in the flame trench), perimeter fence, etc.

***** End of Table 130-2 - Post Launch Photos (MLP, FSS, PAD, Apron, Pad Acreage) *****

*** End of Operation **130** ***

8/10/01

OPERATION 140 Film Review

Shop: **SE**
Cntrl Rm Console: **NA**
OPR: **ETM**
Zone: **NA**
Hazard (Y/N): **N**
Duration (Hrs): **15.0**

NOTE
This operation may be not performed after launch scrub.

WC 150 USA Dev 140 No 01 P
SEE DEV 8/10/01

Operation 140 Not Performed: N/A

140-1 Review engineering films for FOD issues, launch anomalies, or other discrepancies.

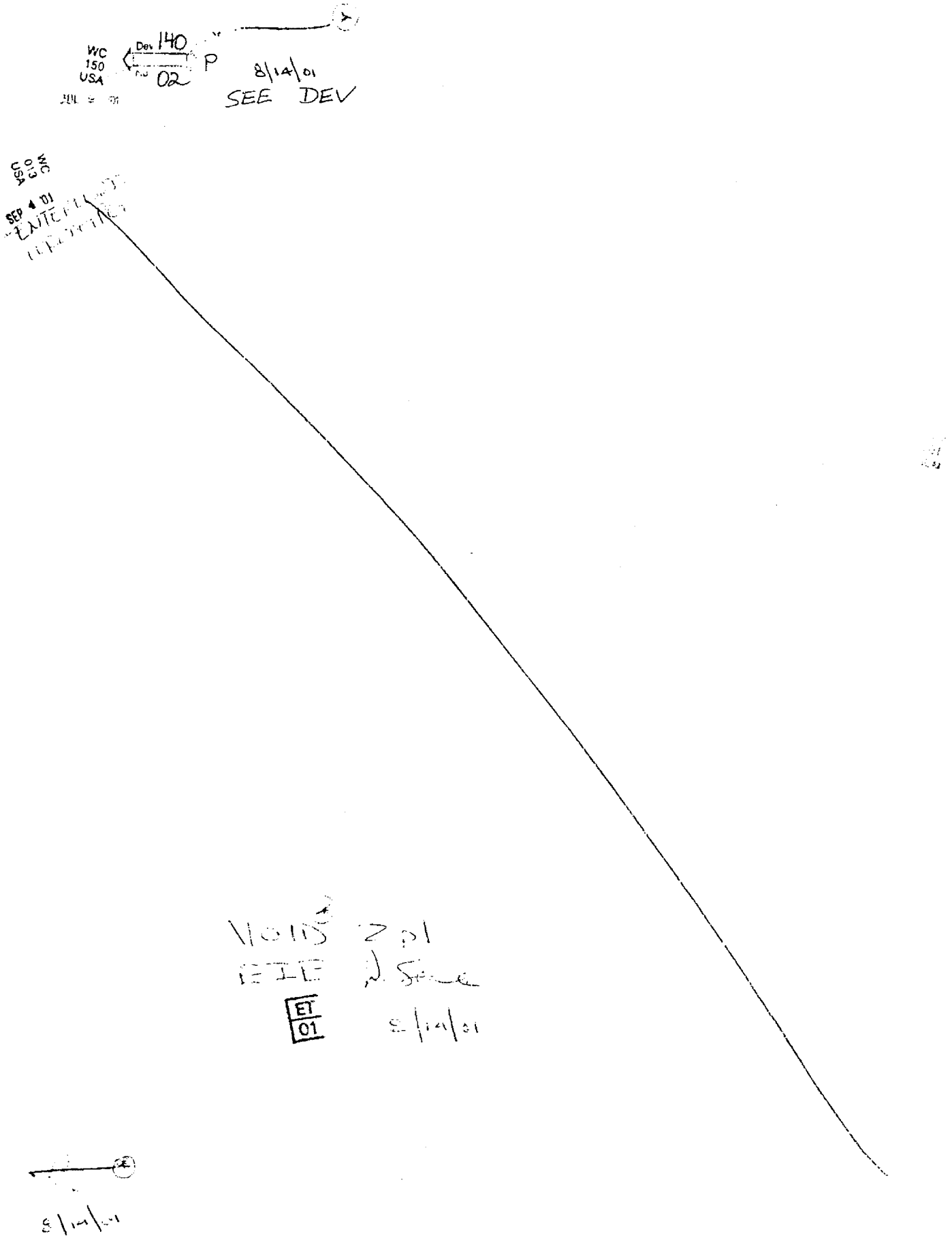
140-2 Operation - Film Review complete.

ETM _____ Date 8/20/01

*** End of Operation **140** ***

WC 013 USA No. 1
SEP 4 '01
ET
8/20/01

8/20/01


WC
150
USA
Dev 140
02
P
8/14/01
SEE DEV
WC
010
USA
SEP 4 01
8/14/01
ET
01
8/14/01

OPERATION 150 Final Report

Shop: **SE**
Cntrl Rm Console: **NA**
OPR: **ETM**
Zone: **NA**
Hazard (Y/N): **N**
Duration (Hrs): **0.5**

NOTE
This operation may be not performed after launch scrub.

Operation 150 Not Performed: N/A

150-1 Assemble final report by attaching following reports to this OMI. Reference each to this step.

Post Launch PAD Assessment
SRB Assessment
Launch Film Review
Launch Day Video Review
Orbiter Landing Assessment
ET Separation Review

150-2 Final report assembly complete.

WC 150 USA Dev. 150 No. 01 P WC 150 USA APR 12 '01

~~OMRSD S00U00.011-1.~~

ETM X _____ Date 3/12/01

150-3 Operation - Final Report complete.

*** End of Operation **150** ***

150-1
~~140-1~~

ET 01

3/13/01

STEP 150-1 $6999

STS-105 POST LAUNCH PAD DEBRIS INSPECTION REPORT

KSC Debris Team
10 August 2001

The post launch inspection of the MLP-3, Pad A FSS and RSS was conducted on 10 August 2001 from Launch – 2 to 3.5 hours(1900 to 2030 EST).

No flight hardware was found.

Orbiter liftoff lateral acceleration data to predict stud hang-ups received from Boeing-Huntington Beach indicated that no SRB holddown stud hang-up had occurred, the reported value was 0.138. Evaluation of the MLP 0-level was performed and the south holddown studs were visually assessed as having no indication of hang-up. Erosion was typical for the north posts with some evidence of missing RTV at the HDP haunch interface. North holddown post blast covers and T-0 umbilical exhibited minimal exhaust plume damage. Both SRB aft skirt GN2 purge lines were intact, protective tape layering was partially eroded, the metal braid was visible only on the LH purge line.

The LO2 and LH2 Tail Service Masts (TSM) appeared undamaged and the LO2 bonnet was observed to have closed properly. The MLP deck was in generally good shape. A section of handrail on west side of the MLP deck was bent and had loose bolts. OTV-054 camera located on the east side of the MLP received extensive launch damage but no missing hardware was noticed. All MLP deck communication connector caps were found intact and secured.

The GH2 vent line latched in the eighth of eight teeth of the latching mechanism. The GUCP 7-inch QD sealing surface exhibited no damage. The deceleration cable was in nominal configuration, while the vent line blanket was sooted and in generally good condition.

The OAA appeared to be intact with no evidence of plume impingement.

All slidewire baskets were secured with no evidence of damage.

The GOX vent arm, hood, ducts and structure appeared to be in good shape with no indications of plume damage.

Debris findings included:

- A piece of twisted sheet metal 10 feet long by 18 inches wide was found near the box car area.
- An A/C duct clamp was found on deck grating at FSS 175 foot levels.

Overall, damage to the pad appeared to be minimal. Minimal debris was noted on pad apron and FSS.

Jorge Rivera NASA-KSC

8/10/01

STEP 15a - 1 $6444

STS-105 LAUNCH DAY VIDEO REVIEW
KSC Photo/Video Analysis Team
10 August 2001

Significant Anomalies - None

Minor Anomalies - None

Funnies - None

Observations

1. Free burning hydrogen was visible near the vertical stabilizer (OTV 070).
2. Numerous pieces of ice from the ET/ORB umbilical shook loose and contacted umbilical sill tiles, but no damage was detected (OTV 009, 063, 054, 061).
3. LH2 and LO2 T-0 umbilical disconnect was normal (OTV 049, 050).
4. Debris particle (probably ice from forward LO2 feedline bellows) was seen falling outboard of ET vertical strut near the ET/ORB interface shortly after SRB ignition. No contact with vehicle observed (OTV 009).
5. Two pieces of ice from forward LO2 feedline bellows observed falling between ET and Orbiter. One piece appears to contact orbiter lower surface (OTV 061).
6. Frost was visible around -Y and +Y ET GOX vent louver (OTV 060, 061).
7. Pieces of aft skirt instafoam fell out of the SRB plume during flight (TV-4, TV-13).
8. Localized flow condensation visible during ascent.
9. Tile surface coating material appeared to be missing from aft side of RH RCS stinger (OTV 051).

Notes
A total of 19 videos were made available for review. Review of long range tracking films is scheduled to begin Saturday, August 11, 2001.

Armando Oliu, NASA - KSC
Thomas Wilson, Boeing-KSC

8/10/01

STEP ISo-1 0403/STS 105

STS-105 POST LAUNCH FILM REVIEW
KSC Photo/Video Analysis Team
11 August 2001

Significant Anomalies - None

Minor Anomalies - None

Funnies - None

Observations

1. SRB separation appeared normal. (E-207, E-212,)
2. SSME Mach diamond formation sequence was 3-2-1. (E-76, -77)
3. Small amount of free-burning GH2 blown in a south-westerly direction by wind. (E-76, E-52)
4. Particles of SRB aft-skirt instafoam fell along side the SRB plume. (E-207, E-212)
5. Body flap and elevon movement during ascent were typical. (E-220, E-212)
6. A piece SRB water trough baggie observed moving upward and then aspirated by plume near RH SRB aft skirt between HDP #2 and #4.
7. Facility debris observed passing through field of view outboard of LH wing tip near FSS. (E-36)
8. Ice particles fell from ET/ORB umbilicals after lift-off. No impact to orbiter lower surface was noted. (E-31, E-36, E-52, E-63)
9. Charring on the ET aft dome was less than typical. (E-207)
10. Umbilical purge barrier baggie material fell during roll maneuver. (E-52, E-207)
11. Forward RCS paper covers were observed falling aft during early ascent.
12. Localized flow condensation observed at various points on the vehicle.
13. Numerous pieces of facility debris entered field of view well after vehicle cleared tower. (E-36, E-40).

Notes
Review of launch pad high-speed films will continue on Monday, August 13, 2001.

Armando Oliu, NASA - KSC
Robert Speece, NASA - KSC
Thomas Wilson, Boeing - KSC

STEP 150-1

STS-105 SRB POST FLIGHT/RETRIEVAL ASSESSMENT

KSC Debris Team
13 August 2001

The BI-109 Solid Rocket Boosters were inspected for debris damage and debris sources at CCAFS Hangar AF on 13 August 2001. Generally, both boosters were in excellent condition.

ANOMALIES - None

FUNNIES

The RH SRB top/left position forward BSM cover was missing. Preliminary examination of the fracture plane revealed no sooting effects, this is indicative of water impact damage.

OBSERVATIONS

1. The TPS on both frustums exhibited no debonds/unbonds. There was minor localized blistering of the Hypalon paint.
2. All seven remaining BSM aero heat shield covers had fully opened and locked. but one RH and two LH cover attach rings had been bent at the hinge by parachute riser entanglement.
3. The forward skirts exhibited no debonds or missing TPS. RSS antennae covers/phenolic base plates were intact, though one layer of the LH SRB +Z antenna phenolic base plate had delamination at the -Y edge.
4. The Field Joint Protection System (FJPS) and the System Tunnel Covers closeouts were generally in good condition with no unbonds observed.
5. Separation of the aft ET/SRB struts appeared normal.
6. Aft skirt external surface TPS was in good condition. Typical blistering of Hypalon paint had occurred on the BTA insulation close-outs and GEI cork runs.
7. The holddown post Debris Containment Systems (DCS) appeared to have functioned normally except on HDP No. 2 which was fully obstructed by the frangible nut halves. This condition most likely happened at water impact.
8. No indication of stud hang up was observed.

Armando Oliu, NASA-KSC
Robert Speece, NASA - KSC

STEP 15c-1 $6444 CONTRACTS

STS-105 POST LAUNCH FILM REVIEW
KSC Photo/Video Analysis Team
13 August 2001

SIGNIFICANT ANOMALIES - None

MINOR ANOMALIES - None

FUNNIES - None

OBSERVATIONS

1. No stud hang up, or ordnance fragments, were observed on any of the SRB hold-down posts.
2. Deluge water pipe leaking adjacent to HDP 3, water dripping on MLP deck.(E-7, E-10)
3. No OMS pod flexing observed. (E-17, E-18)
4. Piece of debris noted between HDP 2 and shoe. (E-8)
5. Free-burning GH2 blown toward southwest.
6. Several ice particles fell from ET/ORB umbilicals during SSME ignition.
7. Vapors on ET aft dome and SRB stiffener rings were observed after T-0.
8. Ice particles fell from LH2 / LO2 TSM T-0 disconnects.
9. Tile surface coating material was lost from aft face of RH OMS RCS stinger. This is a common occurrence due to SSME ignition acoustics.(E-19)
10. SRB throat plug material ejected from exhaust hole. No contact with vehicle.
11. Debris (probable SRB throat plug material RTV) ejected from adjacent to HDP 4, no vehicle contact noted. (E-7, E-15)
12. Dirty water visible dripping off of LH SRB nozzle. (E-9, E-10, E-13, E-15)

NOTES
All delivered launch films have been reviewed at this time.

Armando Oliu, NASA - KSC
Robert Speece, NASA - KSC

8/13/01

STEP 15C-1 SC4H4 [illegible]

STS-105 POST LAUNCH FILM REVIEW
KSC Photo/Video Analysis Team
14 August 2001

SIGNIFICANT ANOMALIES - None

MINOR ANOMALIES - None

FUNNIES

Further analysis of Film Item E-18 shows a cylindrical shaped debris coming into view at GMT 21:10:15.643. As the item falls and tumbles it maintains a cylindrical shape. The debris is possibly a 3-inch long by 0.75-inch diameter facility bolt from the LH2 TSM.

An additional walk-down of the Pad was performed today and no hardware was found.

Launch Accessory personnel will be shown the film and inspections of the TSM will be performed to determine a source.

Armando Oliu, NASA - KSC
Jorge Rivera, NASA - KSC

10 / 13
8/14/01

STS-105 ORBITER POST LANDING INSPECTION

PRELIMINARY DEBRIS ASSESSMENT

22 August 2001

A runway walkdown and preliminary post landing inspection of OV-103 Discovery was conducted at the Kennedy Space Center on SLF runway 15.

The Orbiter lower surface sustained 106 total hits, of which 15 had a major dimension of 1-inch or larger, both numbers are well within family. The majority of the hits (57 total with 11 greater than 1-inch) were located in the area from the nose landing gear to the main landing gear wheel wells on both left and right chines. The pattern and size ratio of these hits is indicative of damage from ET foam loss. Approximately 31 of the total lower surface hits were around the LH2 umbilical area. Most of these damage sites around the ET/ORB umbilical were most likely caused by pieces of the umbilical purge barrier flailing in the airstream and contacting tiles before pulling loose and falling aft.

The largest lower surface tile damage site, located on the LH chine area, measured 5-inches long by 4-inches wide by 0.0625-inches deep. The cause of this damage has not been determined yet.

The landing gear tires were reported to be in good condition.

ET/Orbiter separation devices EO-1, EO-2, and EO-3 functioned normally. No ordnance fragments were found on the runway beneath the umbilicals. The EO-2 and EO-3 fitting retainer springs appeared to be in nominal configuration, though one of the "salad bowl" clips was missing from EO-3. The EO-2/3 pyro debris shutters were fully closed. No debris was found beneath the umbilicals.

Typical amount of tile damage occurred on the base heat shield. All SSME Dome Heat Shield closeout blankets were in good condition.

Three vertical tail leading edge tile damage sites were observed, with two appearing to have a major dimension greater than one inch. There was one tile damage site on the leading edge of the RH OMS Pod.

There were a total of 31 hits, with 7 having one dimension greater than 1-inch, on the window perimeter tiles. Hazing and streaking of forward-facing Orbiter windows appears to be normal. A more detailed inspection will be performed in the OPF.

The post-landing walkdown of Runway 15 was performed immediately after landing. All components of the drag chute were recovered and appeared to have functioned normally. Several FOD items were found on the runway. The debris items found were: a 13-inch long, 10-gauge, metallic wire; a 1-inch long by 0.625-inches wide by 0.250 inches thick metal fragment, and numerous pieces of SLF concrete. All of which were found within

ET
01

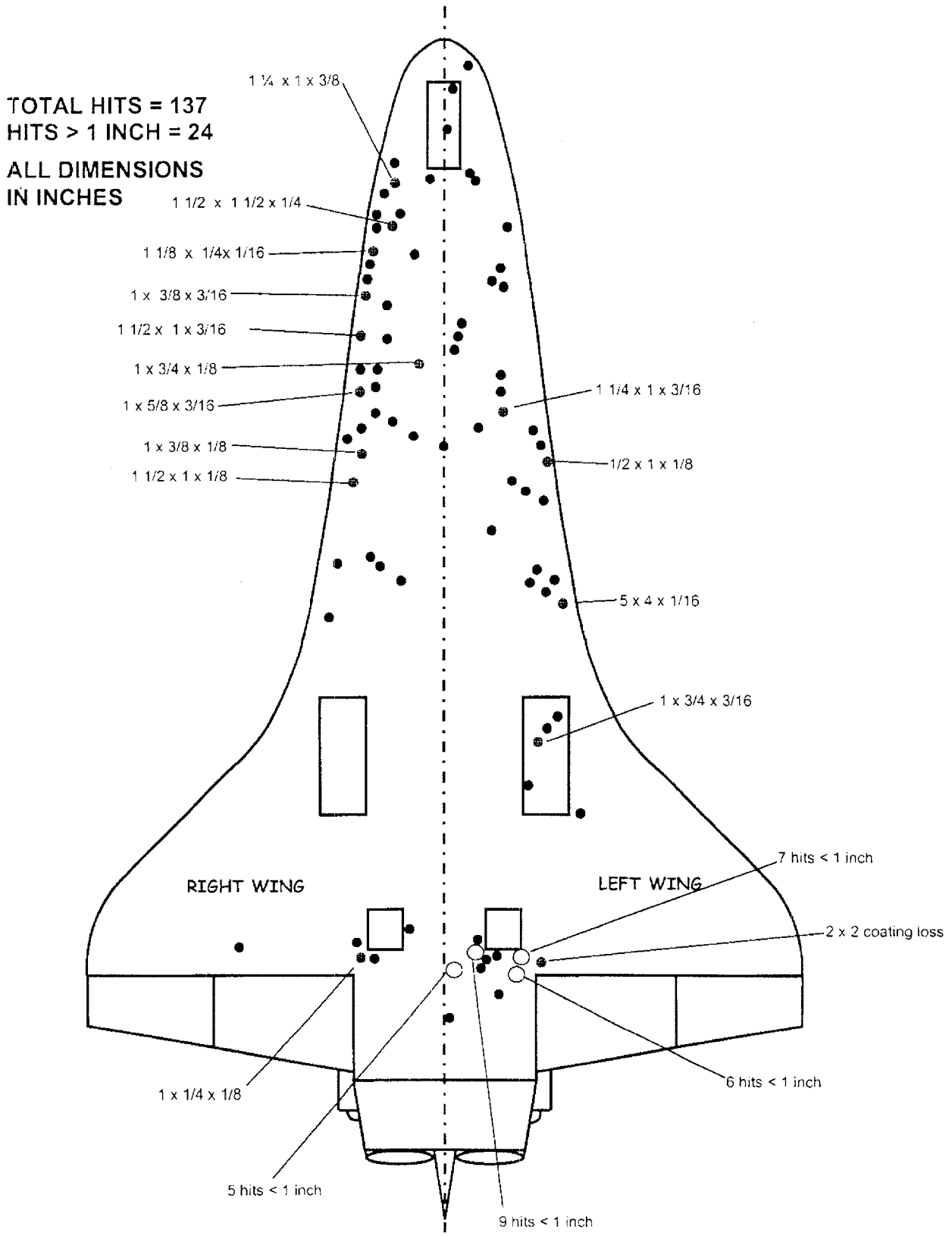
10 feet of the center-line. Additionally, there were also numerous pieces of asphalt found on the approach threshold of runway 15.

In summary, the Orbiter TPS sustained a total of 137 hits, of which 24 had a major dimension of 1-inch or larger. This total does not include the numerous hits on the base heat shield attributed to SSME vibration/acoustics and exhaust plume recirculation.

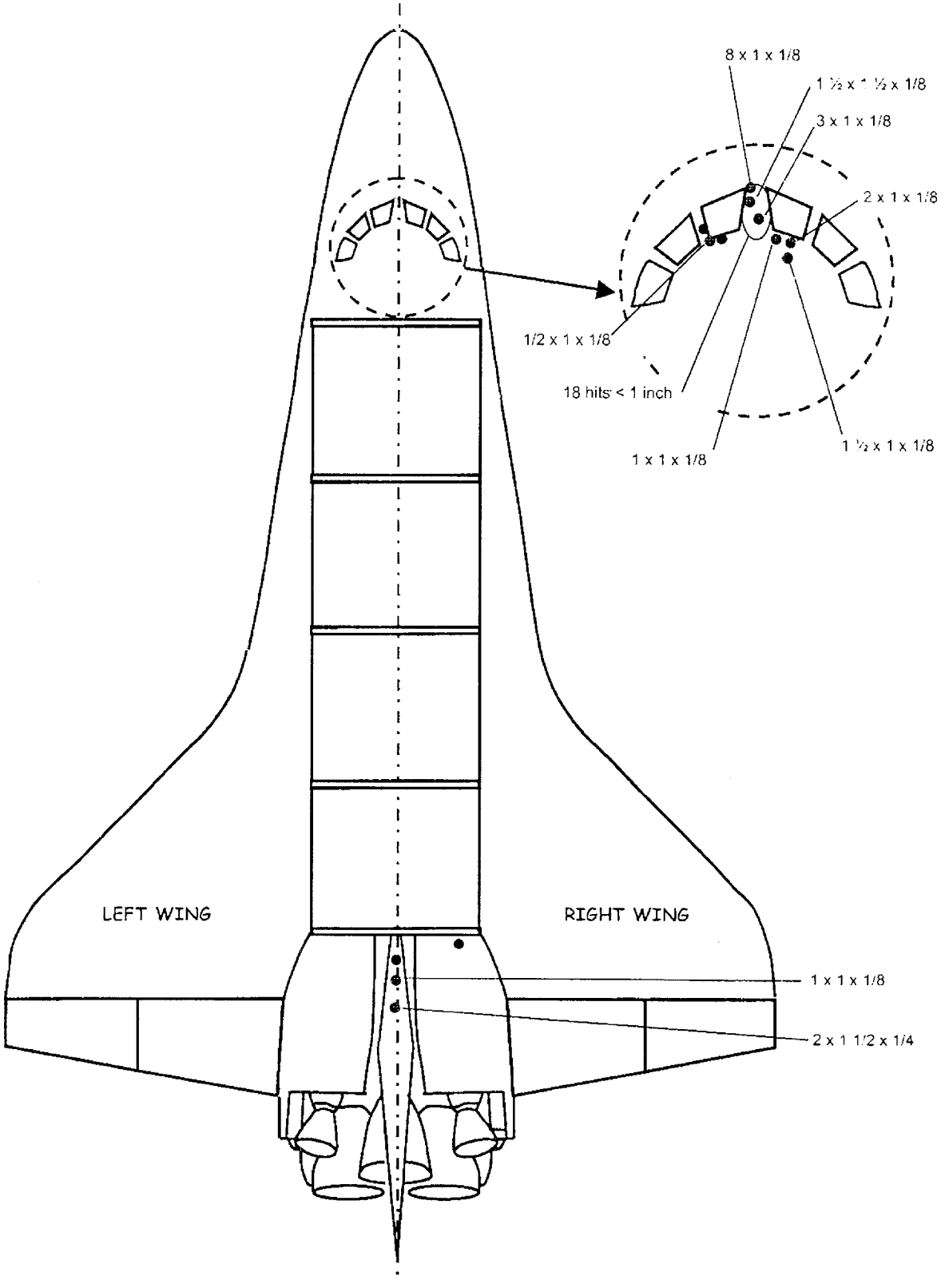
The Orbiter post landing assessment will continue in OPF Bay 2 on Thursday 08/23/01.

Armando Oliu, NASA - KSC
Robert Speece, NASA - KSC
Mike Payne, NASA - KSC
Tony Crisafulli, Boeing-KSC

STS – 105
DEBRIS DAMAGE LOCATIONS



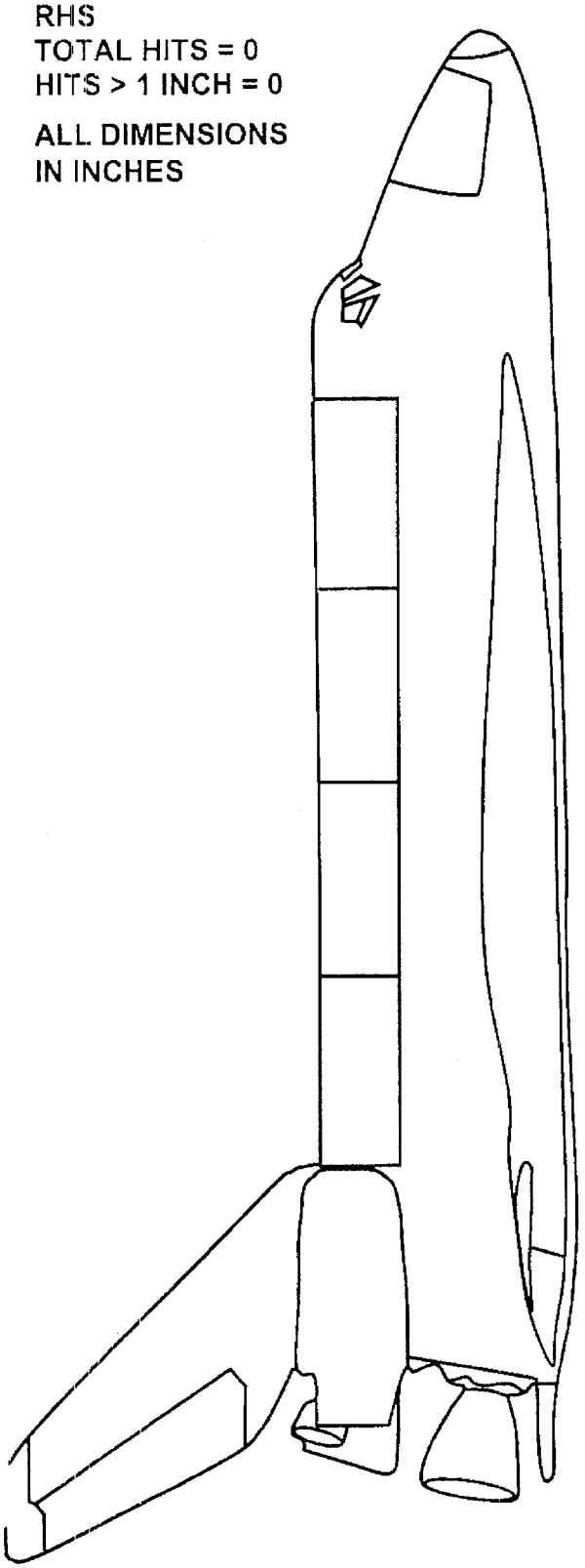
STS – 105
DEBRIS DAMAGE LOCATIONS



STS – 105
DEBRIS DAMAGE LOCATIONS

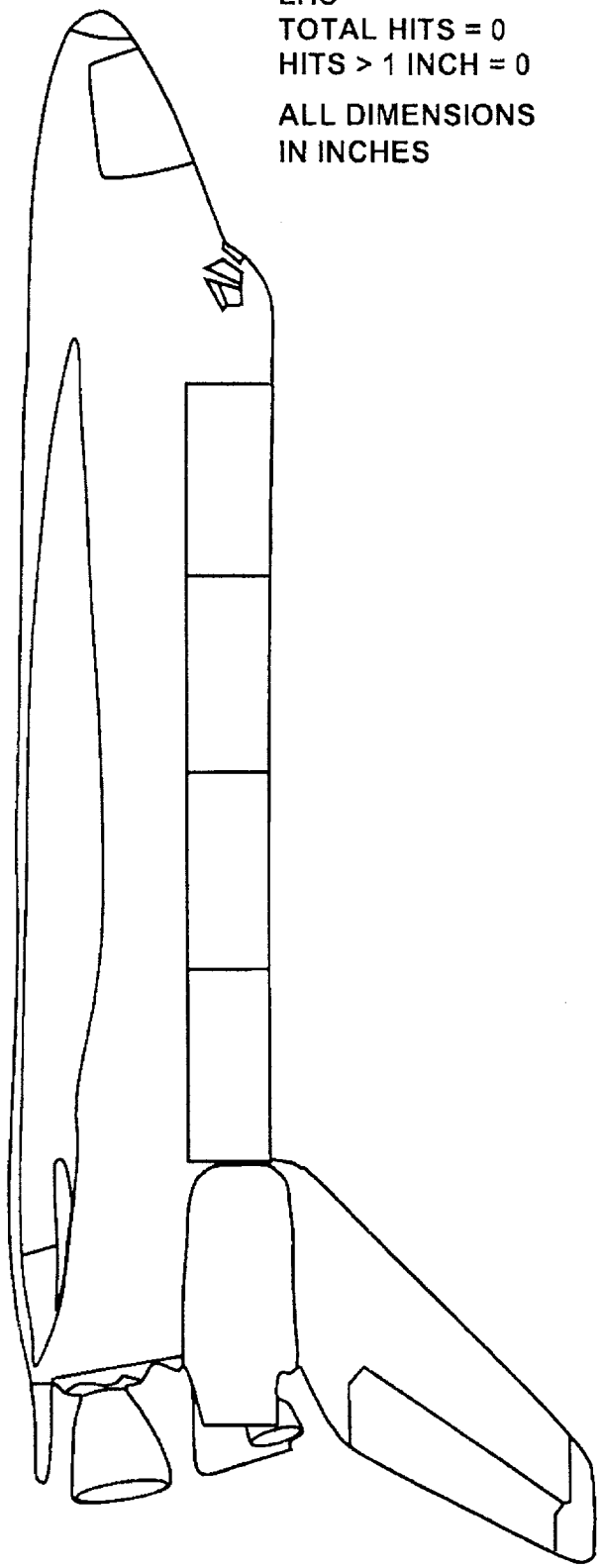
RHS
TOTAL HITS = 0
HITS > 1 INCH = 0

ALL DIMENSIONS
IN INCHES



LHS
TOTAL HITS = 0
HITS > 1 INCH = 0

ALL DIMENSIONS
IN INCHES



STS-105 ORBITER POST LANDING INSPECTION

DEBRIS ASSESSMENT

22 August 2001

After the 2:23 p.m. local/eastern time landing on 22 August 2001, a post landing inspection of OV-103 Discovery was conducted at the Kennedy Space Center on SLF runway 15 and in Orbiter Processing Facility bay 2. This inspection was performed to identify debris impact damage and, if possible, debris sources.

The Orbiter TPS sustained a total of 144 hits of which 25 had a major dimension of 1-inch or larger. This total does not include the numerous hits on the base heat shields attributed to SSME vibration/acoustics and exhaust plume recirculation.

The following table lists the STS-105 Orbiter damage hits by area:

Area	Hits > 1-inch	Total Hits
Lower Surface	15	108
Upper Surface	2	3
Window Area	8	32
Right Side	0	0
Left Side	0	0
Right OMS Pod	0	1
Left OMS Pod	0	0
Totals	**25**	**144**

The Orbiter lower surface sustained 108 total hits, of which 15 had a major dimension of 1-inch or larger, both numbers are well within family. The majority of the hits (57 total with 11 greater than 1-inch) were located in the area from the nose landing gear to the main landing gear wheel wells on both left and right chines. The pattern and size ratio of these hits is indicative of damage from ET foam loss. This is the highest number of hits in this area since the implementation of ET intertank foam venting. Analysis of ET separation film will further aid in the determination of debris sources.

Approximately 31 of the total lower surface hits were around the LH2 umbilical area. Most of these damage sites around the ET/ORB umbilical were most likely caused by pieces of the umbilical purge barrier flailing in the airstream and contacting tiles before pulling loose and falling aft.

The largest lower surface tile damage site, located on the LH chine area, measured 5-inches long by 4-inches wide by 0.0625-inches deep. The cause of this damage has not been determined yet.

The landing gear tires were reported to be in good condition.

ET/Orbiter separation devices EO-1, EO-2, and EO-3 functioned normally. No ordnance fragments were found on the runway beneath the umbilicals. The EO-2 and EO-3 fitting retainer springs appeared to be in nominal configuration, though one of the "salad bowl" clips was missing from EO-3. This condition was present prior to Orbiter/ET mate and was accepted per MR approval for unrestricted use back in 1999 via PR STR-5-14-3015. The EO-2/3 pyro debris shutters were fully closed. No debris was found beneath the umbilicals.

Typical amount of tile damage occurred on the base heat shield. All SSME Dome Heat Shield closeout blankets were in good condition.

Three vertical tail leading edge tile damage sites were observed, with two having a major dimension greater than one inch. There was one tile damage site on the leading edge of the RH OMS Pod.

There were a total of 32 hits, with 8 having one dimension greater than 1-inch, on the window perimeter tiles. Hazing and streaking of forward-facing Orbiter windows appears to be normal.

The post-landing walkdown of Runway 15 was performed immediately after landing. All components of the drag chute were recovered and appeared to have functioned normally. Several FOD items were found on the runway. The debris items found were: a 13-inch long, 10-gauge, metallic wire; a 1-inch long by 0.625-inches wide by 0.250 inches thick metal fragment, and numerous pieces of SLF concrete. All of which were found within 10 feet of the center-line. Additionally, there were also numerous pieces of asphalt found on the approach threshold of runway 15.

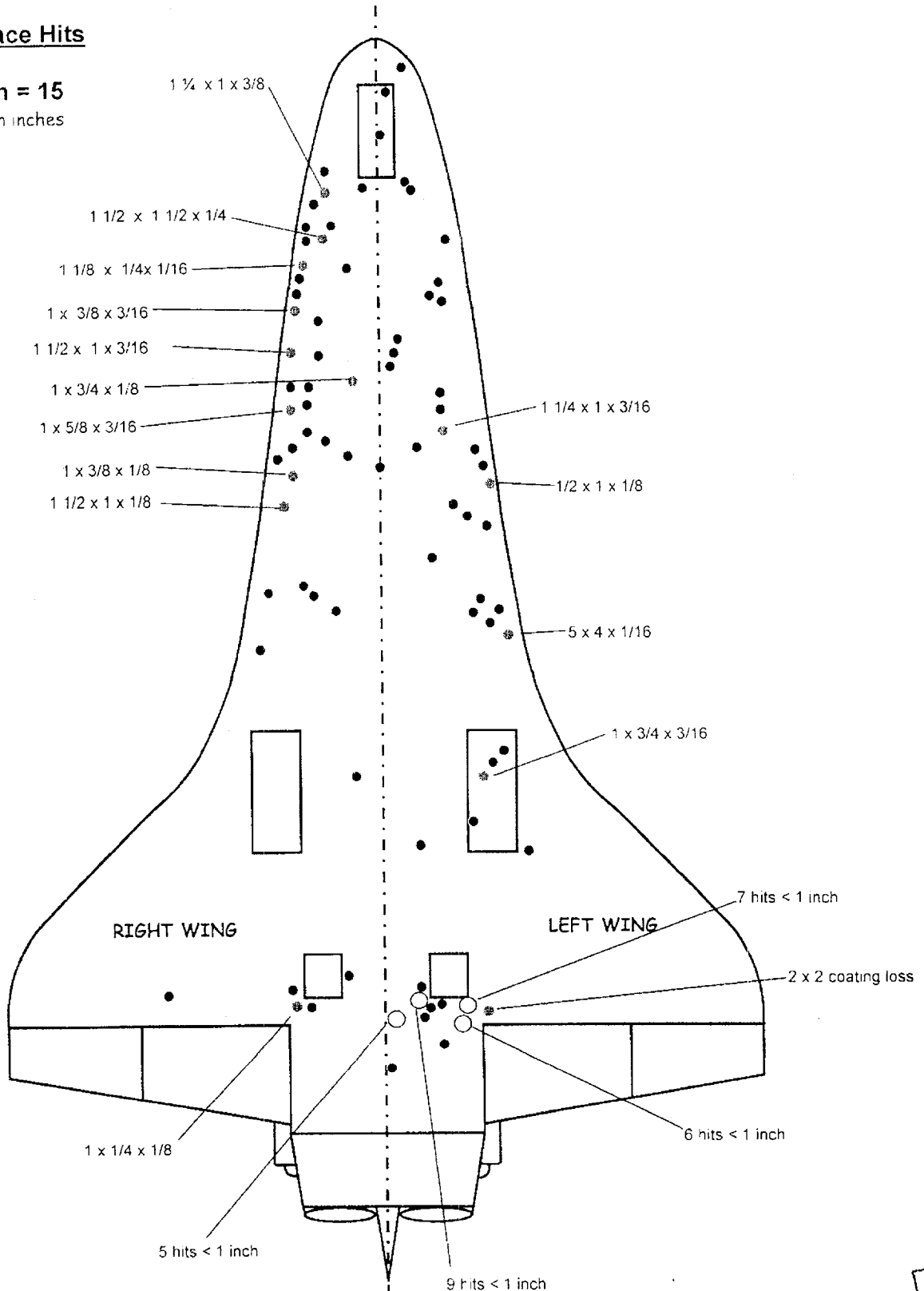
In summary, the total number of Orbiter TPS debris hits and the number of hits 1-inch or larger were within established family, however the number of hits between the main landing gear well and nose landing gear well is higher than normal. The potential identification of debris damage sources for mission STS-105 will be based on the laboratory analysis of Orbiter post landing microchemical samples, inspection of the recovered SRB components, film analysis, and aerodynamic debris particle trajectory analysis. The results of these analyses will be documented in the STS-105 Debris/Ice/TPS Assessment and Integrated Photographic Analysis report.

Armando Oliu
NASA - KSC

ET 01

STS – 105
DEBRIS DAMAGE LOCATIONS

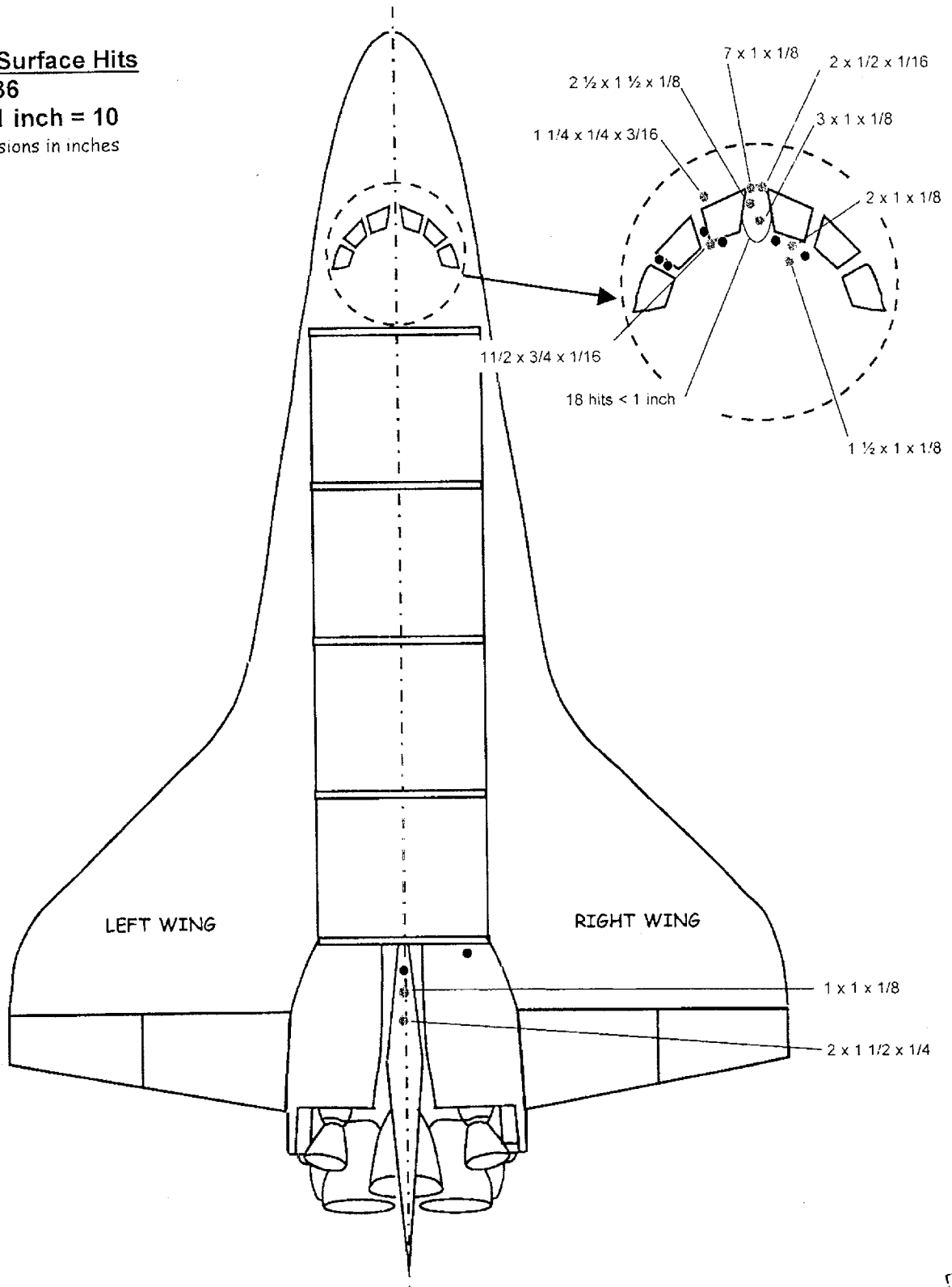
Lower Surface Hits
Hits = 108
Hits > 1 inch = 15
All dimensions in inches



STEP 15-1 $6444 OMS/STRUTS

STS – 105
DEBRIS DAMAGE LOCATIONS

Upper Surface Hits
Hits = 36
Hits > 1 inch = 10
All dimensions in inches



STEP 150-1 $6444

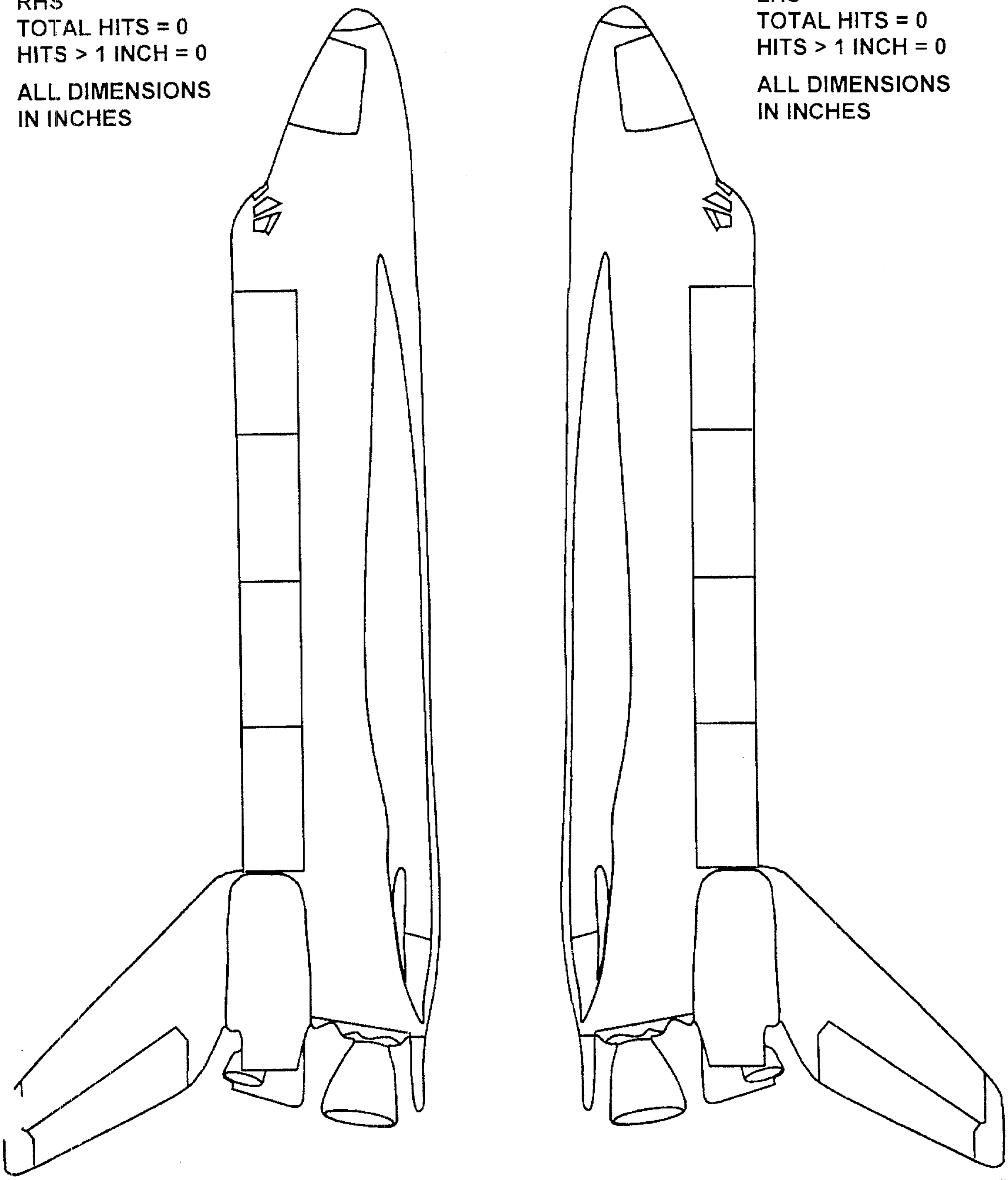
STS – 105
DEBRIS DAMAGE LOCATIONS

RHS
TOTAL HITS = 0
HITS > 1 INCH = 0

ALL DIMENSIONS
IN INCHES

LHS
TOTAL HITS = 0
HITS > 1 INCH = 0

ALL DIMENSIONS
IN INCHES



ET
01

STEP 150-1 $6444

STS-105 ON-ORBIT FILM SUMMARY

KSC Photo/Video Analysis Team
30 August 2001

The last film/video data, 35mm still images from the LO2 ET/ORB umbilical camera, 16mm motion picture with 5mm lens and Crew Hand-Held Still Images and video, of the External Tank after separation from the Orbiter were received and reviewed at KSC on 29 August 2001.

SIGNIFICANT ANOMALIES
None

MINOR ANOMALIES
None

FUNNIES
None

OBSERVATIONS:

1. SRB separation from the External Tank appeared nominal.

2. ET separation from the Orbiter was normal. There was no protrusion of the EO-2 and EO-3 separation bolt.

3. No damage was detected on the LO2 ET/ORB umbilical disconnect, sealing surfaces, or closeout TPS. Typical ablation and divoting was noted on the vertical portion of the umbilical cable tray.

4. There was an 8-inch diameter divot, with foam still partially attached, on the +Y thrust strut near the forward flange.

5. Divot observed on the LH2 tank near the base of the LO2 feedline support bracket closeout at station Xt-1377.

6. Missing foam (2-inches by 6-inches) observed on the LH2 tank acreage near the Xt-1270 location. Remainder of LH2 tank acreage appeared nominal.

7. Small divots observed on the intertank-to-LH2 tank flange between the bipods.

8. Evaluation of the thrust panel TPS was difficult due to lighting condition and image resolution.

ET
01

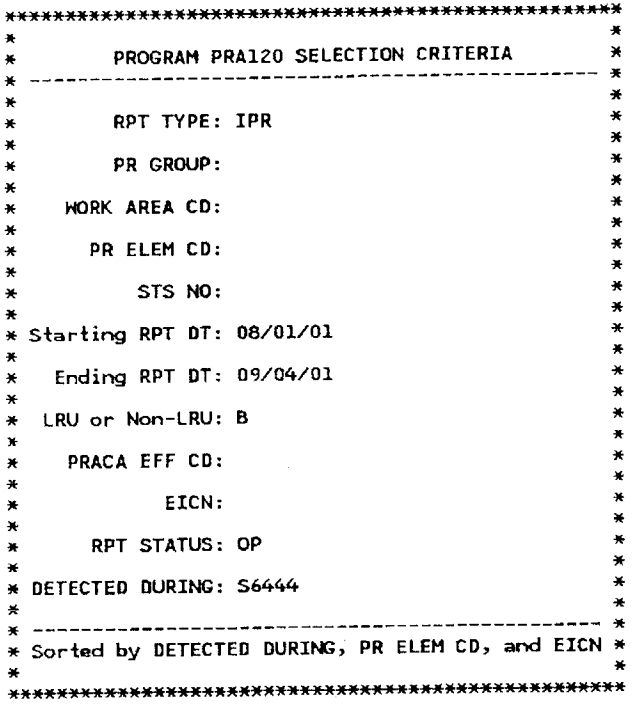
9. No anomalies were detected in the LO2 tank acreage. The BSM burn scars were typical.

10. The ablation/erosion of LO2 feedline flange closeouts was typical.

11. Two small divots observed on the feedline at approximately station Xt-1270.

35mm umbilical film had no coverage LO2 ogive section. Evaluation of this area was difficult with 16mm film and handheld imagery due to image resolution.

Armando Oliu
NASA - KSC


PROGRAM PRA120 SELECTION CRITERIA
RPT TYPE: IPR
PR GROUP:
WORK AREA CD:
PR ELEM CD:
STS NO:
Starting RPT DT: 08/01/01
Ending RPT DT: 09/04/01
LRU or Non-LRU: B
PRACA EFF CD:
EICN:
RPT STATUS: OP
DETECTED DURING: S6444
Sorted by DETECTED DURING, PR ELEM CD, and EICN

PROBLEM REPORTING AND CORRECTIVE ACTION SYSTEM
PROBLEMS BY DETECTED DURING


```
************************************************************
*                                                          *
* NO DATA FOUND ON THE DATABASE FOR THE SELECTED PARAMETERS *
*                                                          *
************************************************************
```

```
*****************
*               *
* END OF REPORT *
*               *
```

DEVIATION INDEX

WAD NO.

[X] PERMANENT [ ] TEMPORARY [ ] TEMP RECYCLE

S6444 REV: J CHG:01 (OMI)

DATE/TIME: 07/02/2001 07:35:56

TASK NO./SEQ. NO. 10

DEV NO.	SEQ/ STEP	EFFECTIVITY	QC/ PP&C	DATE	REMARKS
10-01	10 3		*	2001-06-28	

5/30/01

USA
United Space Alliance

TOP/WAD Deviation

Dev No. 10-01	DILS No. 89333(51)	Page 1 of 5

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J 01	☐ In Family ☒ Out of Family	E	20

First Use Effectivity: ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-104 ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☐ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR: R. Seale ETM 4/27/01	Contractor Test Conductor: TB27 6/28/01	Gov't OPR: PH-H2 [signature] 4/27/01
Contractor Test Project Engineer	Other: USA ET72 Tom Ford 4.27.01	Gov't Project Engineer
Contractor Safety: [signature] 28 Jun 01	Other	Gov't Test Director or Contractor Chief TC

Page Number: 10-1 Step Number: 10-3

Add Operation 11 as follows:

(1) NOTE
IR CAMERA INSTALLATION(S) MAY BE NOT PERFORMED IF ALREADY INSTALLED (PER PREVIOUSLY PERFORMED WAD) OR TECHNICAL CONCERNS PRECLUDE SUCH.

OPERATION 11 - IR Camera Setup

> **WARNING**
> Hard hats required on the Pad when SSV is not present.

> **CAUTION**
> Exercise care to avoid dropping equipment, fasteners, etc. from RSS Roof. All tools must be tethered.

11-1 **Install** IR Camera at RSS Roof site as follows:

1. **Rotate** camera housing back cover to open position by removing bolts with flat washers (20 pl). **Retain** bolts/washers for reinstallation.

2. **Remove** camera housing front cover by removing fasteners (2 pl). **Reinstall** fasteners after cover removal. **Retain** cover for reinstallation after IR Camera Unit removal.

3. **Install** IR Camera Unit into camera housing. **Secure** IR Camera Unit in housing by locking spring pin at lower, left.

(1) SEE P&I CHANGE RECORD R. Seale ETM 8/5/01

Originator (print)	SPDMS ID	Phone	Organization	Date	
R. Seale	T08011	1-3348	ETM	4/27/01	☒ Perm ☐ Temp ☐ Temp-Recycle

USA FORM 4-30A

8/9/01

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J 01	☐ In Family ☒ Out of Family	E	20

First Use ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-104
Effectivity: ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☐ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR	Contractor Test Conductor	Gov't OPR
R. Seale ETM 4/27/01	TO 27 6-28-01	PA-A2 4-27-01
Contractor Test Project Engineer	Other USA ETM2 Tom Ford 4.27.01	Gov't Project Engineer
Contractor Safety K. Seeley 28 Jun. 01	Other	Gov't Test Director or Contractor Chief TC

WARNING

Power cable is live. Care should be exercised when connecting power cable to avoid electric shock.

CAUTION

Do NOT allow opened back cover to exert undue force on cables once cables have been connected.

4. **Connect**:
   - OTV Coaxial cable
   - Pan & Tilt cable
   - Controller cable
   - Power cable

5. **Rotate** camera housing back cover into closed position. **Secure** back cover by installing bolts/flat washers (20 pl). **Tighten** bolts wrench tight.

WARNING

Isopropyl Alcohol is flammable and is a skin, eye and respiratory tract irritant that affects the central nervous system. Insure adequate ventilation, avoid inhalation of vapors and do not use near heat, sparks or open flame. Skin contact may cause redness and pain, eye contact will cause severe eye irritation and may result in permanent damage. Inhalation of vapors in high concentrations has a narcotic effect on the central nervous system. Personnel shall wear **solvex gloves** and **chemical splash goggles** . When working at eye level or above wear a **face shield** over goggles.

WS002.a 04-13-01

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,I, N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J 01	☐ In Family ☒ Out of Family	E	20

First Use ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-104

Effectivity: ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☐ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR	Contractor Test Conductor	Gov't OPR
R. Seale ETM 4/27/01	T027 6-28-01	PH-H2 4-27-01
Contractor Test Project Engineer	Other USA ETM2 Tom Ford 4.27.01	Gov't Project Engineer
Contractor Safety R.L. Saboy 28 Jun.01	Other	Gov't Test Director or Contractor Chief TC

6. **Clean** IR Camera Unit lens plate using (1) roll 8305-00-519-3144 Rymple cloth dampened with (4) ounces 6810-00-543-7915 Isopropyl Alcohol .

7. **Perform** functional checkout of IR Camera Unit using local controller if required at Task Team Leader (TTL) discretion.

S/S 7 Not Performed: N/A

NASA PH-H: N/A Date: N/A

USA ETM: N/A Date: N/A

① NOT PERFORMED 8/9/01

① SEE PAT CHANGE RECORD R. Seale ETM 8/9/01

Originator (print)	SPDMS ID	Phone	Organization	Date	
R. Seale	T08011	1-3348	ETM	4/27/01	☒ Perm ☐ Temp ☐ Temp-Recycle

USA FORM 4-30A

8/9/01

USA
United Space Alliance

TOP/WAD Deviation

Dev No. 10-01	DILS No. 84333(S)	Page 4 of 5

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J 01	☐ In Family ☒ Out of Family	E	20

First Use ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-104
Effectivity: ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT
Affected: ☐ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR	Contractor Test Conductor	Gov't OPR
R. Seale ETM 4/27/01	T.027 628-01	PH-A2 4/27/01
Contractor Test Project Engineer	Other USA ETM2 Tom Ford 4.27.01	Gov't Project Engineer
Contractor Safety 28 Jun 01	Other	Gov't Test Director or Contractor Chief TC

① SEE RFT CHANGE REQ'D R. Seale ETM 8/9/01

~~11-1~~ 11-2 ①

Install IR Camera at Camera Site 2 as follows:

1. **Rotate** camera housing back cover to open position by removing eight ea. bolts using Phillips screwdriver. **Retain** bolts/washers for reinstallation.

2. **Remove** camera housing front cover by removing securing bolt(s). **Reinstall** bolt(s) after cover removal. **Retain** cover for reinstallation after IR Camera Unit removal.

3. **Install** IR Camera Unit into camera housing. **Secure** IR Camera Unit in housing by tightening set screw(s) wrench tight at lower, left/right.

WARNING

Power cable is live. Care should be exercised when connecting power cable to avoid electric shock.

4. **Connect**:
   - OTV Coaxial cable
   - Pan & Tilt cable
   - Controller cable (2 pl)
   - Power cable

5. **Rotate** camera housing back cover into closed position. **Secure** back cover by installing bolts (8 pl). **Tighten** bolts using Phillips screwdriver.

Originator (print)	SPDMS ID	Phone	Organization	Date	
R. Seale	T08011	1-3348	ETM	4/27/01	☒ Perm ☐ Temp ☐ Temp-Recycle

USA FORM 4-30A

8/9/01

United Space Alliance

TOP/WAD Deviation

Dev No. 10-01 | DILS No. 89333(5) | Page 5 of 5

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J 01	☐ In Family ☒ Out of Family	E	20

First Use ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-104
Effectivity ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☐ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor QPR	Contractor Test Conductor	Gov't QPR
R. Seale ETM 4/27/01	T027 6-28-01	PH-H 4-27-01
Contractor Test Project Engineer	Other: USA E7772 Tom Ford 4.27.01	Gov't Project Engineer
Contractor Safety: RK Saxby 28 Jun.01	Other	Gov't Test Director or Contractor Chief TC

WARNING

Isopropyl Alcohol is flammable and is a skin, eye and respiratory tract irritant that affects the central nervous system. Insure adequate ventilation, avoid inhalation of vapors and do not use near heat, sparks or open flame. Skin contact may cause redness and pain, eye contact will cause severe eye irritation and may result in permanent damage. Inhalation of vapors in high concentrations has a narcotic effect on the central nervous system. Personnel shall wear **solvex gloves** and **chemical splash goggles** . When working at eye level or above wear a **face shield** over goggles.

WS002.a 04-13-01

6. **Clean** IR Camera Unit lens plate using (1) roll 8305-00-519-3144 Rymple cloth dampened with (4) ounces 6810-00-543-7915 Isopropyl Alcohol .

7. **Perform** functional checkout of IR Camera Unit using local controller if required at Task Team Leader (TTL) discretion.

S/S 7 Not Performed: N/A

NASA PH-H: N/A Date: N/A

USA ETM: N/A Date: N/A

① NOT PERFORMED 8/9/01

Reason: Establish operational controls for installation of the IR Camera units on the RSS Roof and Camera Site 2.

Originator (print)	SPDMS ID	Phone	Organization	Date	
R. Seale	T08011	1-3348	ETM	4/27/01	☒ Perm ☐ Temp ☐ Temp-Recycle

USA FORM 4-30A

① R. Seale ETM 8/9/01 SEE P&I CHANGE RECORD

8/9/01

DEVIATION INDEX

WAD NO.

☒ PERMANENT ☐ TEMPORARY ☐ TEMP RECYCLE

S6444 REV: J CHG:01 (OMI)

DATE/TIME: 04/10/2001 05:38:00

TASK NO./SEQ. NO. 50

DEV NO.	SEQ/ STEP	EFFECTIVITY	QC/ PP&C	DATE	REMARKS
50-01	50 8		*	2001-04-09	

USA United Space Alliance

TOP/WAD Deviation

Dev No. 50-01	DILS No. 87031 (s)	Page 1 of 4

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J01	☐ In Family ☒ Out of Family	E	30

First Use Effectivity: ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-100 ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☒ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR: R. Seale ETM 4/5/01	Contractor Test Conductor: Jim Taylor 4-9-01	Gov't OPR: [signature] PH-H2 4-6-01
Contractor/Test Project Engineer: [signature] 4/9/01	Other: Mark Wollam 4/5/01	Gov't Project Engineer
Contractor Safety	Other	Gov't Test Director or Contractor Chief TC: [signature] NTD 4/9/01

Page Number: 50-4 Step Number: 50-8

Add following (one line below end of step text):

OMRS S00FB0.350-1

Originator (print)	SPDMS ID	Phone	Organization	Date	
R. Seale	T08011	1-3348	ETM	4/5/01	☒ Perm ☐ Temp ☐ Temp-Recycle

USA FORM 4-30A

USA
United Space Alliance

TOP/WAD Deviation

Dev No. 50-01	DILS No. 87031 (S)	Page 2 of 4

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J01	☐ In Family ☒ Out of Family	E	30

First Use ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-100
Effectivity: ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT
Affected: ☒ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR	Contractor Test Conductor	Gov't OPR
R. Seale ETM 4/5/01	Jim Taylor 4-9-01	PH-H2 Robert F. Affleck 4-6-01
Contractor Test Project Engineer	**Other**	**Gov't Project Engineer**
Dan Kelley Conoco 4/9/01	Mark Wollam 4/5/01	
Contractor Safety	**Other**	**Gov't Test Director or Contractor Chief TC**
		NTD Richard Fayne 4/9/01

Page Number: 50-5 Step Number: 50-10

Add steps 50-10.1 with preceding Note and 50-10.2 as follows:

> **NOTE**
>
> Excessive vapors are defined as being more severe than those described in NSTS 08303 (LI) NSTS PROGRAM ICE/DEBRIS INSPECTION CRITERIA or NSTS 16007 (LI) NSTS PROGRAM LAUNCH COMMIT CRITERIA - HAZARDOUS GAS SUBSYTEM .

50-10.1 CTIF CVM1 222
CVM2

From start of LO_2 / LH_2 loading until Prepressurization (LO_2 at T-2M55s and LH_2 at T-1M57s):

1. **Monitor** following ET-Orbiter MPS areas for leakage:
   - LO_2 Feedline (portion external to the Intertank)
   - LH_2 Feedline
   - LH_2 Recirculation Line
   - LH_2 Aft Dome Manhole Cover(s)
   - ET-Orbiter LO_2 / LH_2 Umbilical Disconnects
   - LH_2 T-0 Umbilical
   - LO_2 T-0 Umbilical
2. **Verify** no visible cryogenic liquid of excessive vapors.

OMRS (general) S00FB0.360-1

ETM ME 08 Date 6-10-01

Not Performed: N/A

Originator (print)	SPDMS ID	Phone	Organization	Date	☒ Perm ☐ Temp ☐ Temp-Recycle
R. Seale	T08011	1-3348	ETM	4/5/01	

5/10/01

USA FORM 4-30A

United Space Alliance

TOP/WAD Deviation

Dev No. 50-01	DILS No. 87031 (5)	Page 3 of 4

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J01	☐ In Family ☒ Out of Family	E	30

First Use Effectivity: ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-100 ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☒ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR	Contractor Test Conductor	Gov't OPR
R. Seale ETM 4/5/01	Jim Taylor 4-9-01	Robert F. Speer PH-H2 4-6-01
Contractor Test Project Engineer	**Other**	**Gov't Project Engineer**
Karl Cleary Connecty 4/9/01	Mark Wollam 4/5/01	
Contractor Safety	**Other**	**Gov't Test Director or Contractor Chief TC**
		Stephen J Tape 4/9/01

50-10.2 CTIF CVM1 222
CVM2

Monitor and videotape **record** following ET TPS surface areas and GO_2 Vent Area during LO_2 / LH_2 loading through Prepressurization (LO_2 at T-2M55s and LH_2 at T-1M57s):

- LH_2 Aft Dome
- LH_2 Barrel
- Intertank (external)
- LO_2 Tank
- GO_2 Vent Area
- Protuberances

OMRS (general) S00FB0.005-1

ETM _____ Date 8-10-01

Not Performed: N/A

Originator (print)	SPDMS ID	Phone	Organization	Date	☒ Perm ☐ Temp ☐ Temp-Recycle
R Seale	T08011	1-3348	ETM	4/5/01	

USA FORM 4-30A

5/10/01

USA
United Space Alliance

TOP/WAD Deviation

Dev No. 50-01	DILS No. 87031 (S)	Page 4 of 4

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J01	☐ In Family ☒ Out of Family	E	30

First Use Effectivity: ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-100 ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☒ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR: F. Seale ETM 4/5/01	Contractor Test Conductor: Jim Taylor 4-9-01	Gov't OPR: Robert F. Spence PH-H2 4-6-01
Contractor Test Project Engineer: Carl Cleary [illegible] 4/5/01	Other: Mark Wollam 4/5/01	Gov't Project Engineer
Contractor Safety	Other	Gov't Test Director or Contractor Chief TC: Stephen Hope NTD 4/9/01

Page Number: 50-9 Step Number: 50-18

Change step 50-18 as follows:

was: "... are 38 knots or ..."

is: "... are 38 knots (peak as measured at 60 feet above ground) or ..."

Page Number: 50-9 Step Number: 50-19

Add step 50-19.1 as follows:

50-19.1 CTIF

ET-Orbiter MPS monitoring for leakage and ET TPS Surface Areas and GO_2 Vent Area monitoring/recording for launch complete.

OMRSD S00FB0.005-1 [illegible]
OMRSD S00FB0.360-1 [illegible]

ETM ____________ Date 8-10-01

Not Performed: N/A

Reason: Ensure text of operational instructions complies with the OMRS.

Originator (print)	SPDMS ID	Phone	Organization	Date	
F. Seale	T08011	1-3348	ETM	4/5/01	☒ Perm ☐ Temp ☐ Temp-Recycle

USA FORM 4-30A

DEVIATION INDEX

WAD NO.

☒ PERMANENT ☐ TEMPORARY ☐ TEMP RECYCLE

S6444 REV: J CHG:01 (OMI)

DATE/TIME: 04/10/2001 05:38:10

TASK NO./SEQ. NO. 60

DEV NO.	SEQ/ STEP	EFFECTIVITY	QC/ PP&C	DATE	REMARKS
60-01	60 1		*	2001-04-09	

7-7-01

USA
United Space Alliance

TOP/WAD Deviation

Dev No. 60-01	DILS No. 87032 (s)	Page 1 of 1

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J01	☐ In Family ☒ Out of Family	E	30

First Use ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-100
Effectivity: ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☒ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR	Contractor Test Conductor	Gov't OPR
K. Seale Eim 4/5/01	ME 10 Jim Taylor 4-9-01	PH-H2 Robert F. Spence 4-6-01
Contractor Test/Project Engineer	Other	Gov't Project Engineer
Paul Calloway Conway 4/3/01	Mark Wollam 4/5/01	
Contractor Safety	Other	Gov't Test Director or Contractor Chief TC
		Stephen Rose NTD 4/9/01

Page Number: 60-1 Step Number: 60-1

TRC 4-4-01 ET 01

Delete OMRS S00FB0.005-1 and S00L00.150-1 from Note preceding step 60-1: "Noted ... operation." ①

USA VM 067

Page Number: 60-6 Step Number: 60-12

TRC 4-4-01 ET 01

Delete OMRSD S00FB0.005-1 and OMRSD S00L00.150 ~~from~~ and step 60-12. ①

USA VM 067

Reason: These OMRSD's have been moved to Operation 50.

Originator (print)	SPDMS ID	Phone	Organization	Date	☒ Perm ☐ Temp ☐ Temp-Recycle
R. Seale	T08011	1-3348	ETM	4/5/01	

USA FORM 4-30A

DEVIATION INDEX

WAD NO.

☒ PERMANENT ☐ TEMPORARY ☐ TEMP RECYCLE

S6444 REV: J CHG:01 (OMI)

DATE/TIME: 04/10/2001 05:38:16

TASK NO./SEQ. NO. 70

DEV NO.	SEQ/ STEP	EFFECTIVITY	QC/ PP&C	DATE	REMARKS
70-01	70 1		*	2001-04-09	

USA
United Space Alliance

TOP/WAD Deviation

Dev No. 70-01	DILS No. 87033 (S)	Page 1 of 1

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J01	☐ In Family ☒ Out of Family	E	30

First Use ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-100
Effectivity ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☒ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR	Contractor Test Conductor	Gov't OPR
R. Seale ETM 4/5/01	Jim J. for 4-9-01 ME 10	PH-A2 4-6-01
Contractor Test Project Engineer	Other: Mark Wollam ① 4/5/01	Gov't Project Engineer
Contractor Safety	Other:	Gov't Test Director or Contractor Chief TC
		Stephen J. Payne 4/9/01

Page Number: 70-1 Step Number: 70-1

Delete OMRS S00FB0.005-1 and S00FB0.360-1 from Note preceding step 70-1: "Noted ... operation." ①

Page Number: 70-6 Step Number: 70-12

Delete OMRSD S00FB0.005-1 and OMRSD S00FB0.360-1 ~~from~~ and step 70-12. ①

Reason: These OMRSD's are satisfied via Operation 50.

Originator (print)	SPDMS ID	Phone	Organization	Date	☒ Perm ☐ Temp ☐ Temp-Recycle
R. Seale	T08011	1-3348	ETM	4/5/01	

USA FORM 4-30A

DEVIATION INDEX

WAD NO.

☒ PERMANENT ☐ TEMPORARY ☐ TEMP RECYCLE

S6444 REV: J CHG:01 (OMI)

DATE/TIME: 04/10/2001 05:39:17

TASK NO./SEQ. NO. 130

DEV NO.	SEQ/ STEP	EFFECTIVITY	QC/ PP&C	DATE	REMARKS
130-01	130 2		*	2001-04-09	

USA

United Space Alliance

TOP/WAD Deviation

Dev No. 130-01	DILS No. 87034 (S)	Page 1 of 1

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J01	☐ In Family ☒ Out of Family	E	30

First Use Effectivity: ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-100 ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☒ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR: R. Seale ETM 4/5/01	Contractor Test Conductor: Jim Taylor 4-9-01	Gov't OPR: PH-H2 4-6-01
Contractor Test/Project Engineer: 4/9/01	Other: Mark Wollam 4/5/01	Gov't Project Engineer
Contractor Safety	Other	Gov't Test Director or Contractor Chief TC: Stephen Payne NTD 4/9/01

Page Number: 130-2 Step Number: 130-2

Add following Note prior to step 130-2:

NOTE
Post Launch Walkdown must be performed prior to washdown and Pad being opened for normal work.

Reason: Ensure text of operational instructions complies with OMRS S00U00.010-1.

Originator (print)	SPDMS ID	Phone	Organization	Date	
R. Seale	T08011	1-3348	ETM	4/5/01	☒ Perm ☐ Temp ☐ Temp-Recycle

USA FORM 4-30A

8/10/01

DEVIATION INDEX

WAD NO.

☒ PERMANENT ☐ TEMPORARY ☐ TEMP RECYCLE

S6444 REV: J CHG:01 (OMI)

DATE/TIME: 07/02/2001 07:36:23

TASK NO./SEQ. NO. 140

DEV NO.	SEQ/ STEP	EFFECTIVITY	QC/ PP&C	DATE	REMARKS
140-01	140 1		*	2001-04-09	
140-02	140 2		*	2001-06-28	

USA
United Space Alliance

TOP/WAD Deviation

Dev No. 140-01	DILS No. 87035 (5)	Page 1 of 1

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J01	☐ In Family ☒ Out of Family	E	30

First Use ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-100
Effectivity: ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☒ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR	Contractor Test Conductor	Gov't OPR
R. Seale ETM 4/5/01	4-9-01	PH-H2 4/6/01
Contractor Test Project Engineer	**Other**	**Gov't Project Engineer**
Concurs 4/9/01	Mark Wollan 4/5/01	
Contractor Safety	**Other**	**Gov't Test Director or Contractor Chief TC**
		NTD 4/9/01

Page Number: 140-1 Step Number: 140-1

Add following Note and change step 140-1 to read as follows:

NOTE

Analysis of Pad Debris Inspection Results determines priority for film review. All critical film (as determined by the Debris Team) must be reviewed as soon as possible after launch and no later than 36 hours prior to entry (of the Orbiter into the earth's atmosphere).

140-1 **Review** and **analyze** all engineering launch (and flight film) to:

- Identify any debris damage to the SSV
- Identify flight vehicle or ground system damage that could affect Orbiter flight operations or future SSV launches.

OMRSD S00U00.011-1 USA

ETM: R. Seale Date 4/5/01

Reason: Ensure text of operational instructions complies with the OMRS S00U00.011-1.

Originator (print)	SPDMS ID	Phone	Organization	Date	☒ Perm ☐ Temp ☐ Temp-Recycle
R. Seale	T08011	1-3348	ETM	4/5/01	

USA FORM 4-30A

United Space Alliance

TOP/WAD Deviation

Dev No. 140-02	DILS No. 84334 (S)	Page 1 of 5

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J 01	☐ In Family ☒ Out of Family	E	20

First Use: ☐ SRB B:- ☐ ET ☐ GSE ☒ STS-104

Effectivity: ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☐ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR	Contractor Test Conductor	Gov't OPR
R. Seale ETM 6/27/01	T027 6-28-01	6-28-01
Contractor Test Project Engineer	Other	Gov't Project Engineer
Contractor Safety	Other QE Chuck Richards 6-27-01	Gov't Test Director or Contractor Chief TC
K. Sabey 28 Jun. 01		

Page Number: 140-1 Step Number: 140-2

Add Operation 141 as follows:

NOTE
IF CAMERA REMOVAL MAY NOT BE PERFORMED DURING LAUNCH COUNTDOWN/RECYCLE SCENARIOS.

OPERATION 141 - IR Camera Removal

WARNING

Hard hats required on the Pad when SSV is not present.

CAUTION

Exercise care to avoid dropping equipment, fasteners, etc. from RSS Roof. All tools must be tethered.

141-1
~~11-1~~ **Remove** IR Camera from RSS Roof site as follows:

1. **Remove** fasteners (2 pl) from camera housing front. **Retain** fasteners for reinstallation when front cover is installed.

2. **Install** camera housing front cover using previously removed fasteners (2 pl). **Tighten** fasteners (2 pl) wrench tight.

SEE P&I CHANGE RECORD
R. Seale ETM 8/14/01

Originator (print)	SPDMS ID	Phone	Organization	Date	
R. Seale	T08011	1-3348	ETM	6/27/01	☒ Perm ☐ Temp ☐ Temp-Recycle

USA FORM 4-30A

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J 01	☐ In Family ☒ Out of Family	E	20

First Use: ☐ SRB B!- ☐ ET ☐ GSE ☒ STS-104

Effectivity: ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☐ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR	Contractor Test Conductor	Gov't OPR
R. Seale ETM 6/27/01	TO27 6-28-01	PA-H2 6-28-01
Contractor Test Project Engineer	**Other**	**Gov't Project Engineer**
Contractor Safety	**Other** SE Check	**Gov't Test Director or Contractor Chief TC**
K. Saboy 28 Jun. 01	6-27-01	

WARNING

Power cable is live. Care should be exercised when disconnecting power cable to avoid electric shock.

CAUTION

Do NOT allow back cover to exert undue force on cables when opening/rotating back over.

3. **Rotate** camera housing back cover to open position by removing bolts with flat washers (20 pl). **Retain** bolts/washers for reinstallation.

4. **Disconnect**:
   - Power cable
   - Pan & Tilt cable
   - Controller cable
   - OTV Coaxial cable

5. **Unlock** spring pin at lower, left to release IR Camera Unit in camera housing. **Remove** IR Camera Unit from camera housing by carefully sliding it out the back opening of the camera housing. **Support** IR Camera Unit during removal.

6. **Rotate** camera housing back cover into closed position. Do not pinch cables. **Secure** back cover by reinstalling bolts/flat washers (20 pl). **Tighten** bolts wrench tight.

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J 01	☐ In Family ☒ Out of Family	E	20

First Use ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-104
Effectivity: ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT
Affected: ☐ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR	Contractor Test Conductor	Gov't OPR
R Seale ETM 6/27/01	TO 27 6-28-01	PH-H2 6-28-01
Contractor Test Project Engineer	Other	Gov't Project Engineer
Contractor Safety	Other	Gov't Test Director or Contractor Chief TC
K Sabey 28 Jun.01	6-27-01	

WARNING

Isopropyl Alcohol is flammable and is a skin, eye and respiratory tract irritant that affects the central nervous system. Insure adequate ventilation, avoid inhalation of vapors and do not use near heat, sparks or open flame. Skin contact may cause redness and pain, eye contact will cause severe eye irritation and may result in permanent damage. Inhalation of vapors in high concentrations has a narcotic effect on the central nervous system. Personnel shall wear **solvex gloves** and **chemical splash goggles** . When working at eye level or above wear a **face shield** over goggles.

WS002.a 04-13-01

7. **Clean** IR Camera Unit lens plate using (1) roll 8305-00-519-3144 Rymple cloth dampened with (4) ounces 6810-00-543-7915 Isopropyl Alcohol .

8. **Route** IR Camera Unit to VAB 3K1 for refurb/checkout.

NASA PH-H: [signature] Date: 8/31/01

USA ETM: Tom Ford Date: 8-15-01

NOT PERFORMED N/A

Originator (print)	SPDMS ID	Phone	Organization	Date	
R. Seale	T08011	1-3348	ETM	6/27/01	☒ Perm ☐ Temp ☐ Temp-Recycle

United Space Alliance

TOP/WAD Deviation

Dev No. 140-02	DILS No. 84334 (9)	Page 4 of 5

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J 01	☐ In Family ☒ Out of Family	E	20

First Use ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-104

Effectivity: ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☐ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR	Contractor Test Conductor	Gov't OPR
R. Seale ETM 6/27/01	TO27 6-28-01	PHR 6-28-01
Contractor Test Project Engineer	**Other**	**Gov't Project Engineer**
Contractor Safety	**Other** SE Check	**Gov't Test Director or Contractor Chief TC**
K Seeley 28 Jun. 01	6-27-01	

© 141-2.

~~1.1.1~~ **Remove** IR Camera from Camera Site 2 as follows:

1. **Remove** bolt(s) from camera housing front. **Retain** bolt(s) for reinstallation when front cover is installed.

2. **Install** camera housing front cover using previously removed bolt(s). **Torque** bolt(s) wrench tight.

WARNING

Power cable is live. Care should be exercised when disconnecting power cable to avoid electric shock.

CAUTION

Do NOT allow back cover to exert undue force on cables when opening/rotating back over.

3. **Loosen** screws (8 pl) securing camera housing back cover using Phillips screwdriver. **Rotate** camera housing back cover to open position. **Retain** bolts/washers for reinstallation.

4. **Disconnect**:
   - Power cable
   - Pan & Tilt cable
   - Controller cable (2 pl)
   - OTV Coaxial cable

5. **Unscrew** set screw(s) at lower, left/right to release IR Camera Unit in camera housing. **Remove** IR Camera Unit from camera housing by carefully sliding it out the back opening of the camera housing. **Support** IR Camera Unit during removal.

© SEE P & L CHANGE RECORD
R. Seale ETM 8/14/01

Originator (print)	SPDMS ID	Phone	Organization	Date	
R. Seale	T08011	1-3348	ETM	6/27/01	☒ Perm ☐ Temp ☐ Temp-Recycle

USA FORM 4-30A

TOP/WAD Deviation

Dev No. 140.02	DILS No. 84334 (5)	Page 5 of 5

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J 01	☐ In Family ☒ Out of Family	E	20

First Use Effectivity: ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-104 ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT

Affected: ☐ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR	Contractor Test Conductor	Gov't OPR
R. Seale ETM 6/27/01	TO 27 6-28-01	PH-HL 6-28-01
Contractor Test Project Engineer	Other	Gov't Project Engineer
Contractor Safety	Other Richards SR Check	Gov't Test Director or Contractor Chief TC
28 Jun. 01	6-27-01	

6. Coat camera housing back cover O-ring with a single coat of (1) tube / jar 6505-00-133-8025 Petroleum Jelly, Vaseline (or equivalent).

5. **Rotate** camera housing back cover into closed position. Do not pinch cables. **Secure** back cover by installing screws (8 pl). **Tighten** screws wrench tight using Phillips screwdriver.

> **WARNING**
>
> **Isopropyl Alcohol is flammable and is a skin, eye and respiratory tract irritant that affects the central nervous system**. Insure adequate ventilation, avoid inhalation of vapors and do not use near heat, sparks or open flame. Skin contact may cause redness and pain, eye contact will cause severe eye irritation and may result in permanent damage. Inhalation of vapors in high concentrations has a narcotic effect on the central nervous system. Personnel shall wear **solvex gloves** and **chemical splash goggles** . When working at eye level or above wear a **face shield** over goggles.
>
> WS002.a 04-13-01

7. **Clean** IR Camera Unit lens plate using (1) roll 8305-00-519-3144 Rymple cloth dampened with (4) ounces 6810-00-543-7915 Isopropyl Alcohol .

8. **Route** IR Camera Unit to VAB 3K1 for refurb/checkout.

NASA PH-H: [signature] Date: 8/15/01

USA ETM: Tom Fogl Date: 8-15-01

NOT PERFORMED N/A ①

① See A+I Change Req'd R. Seale ETM 6/16/01

Reason: Establish operational controls for removal of IR Camera units from the RSS Roof and Camera Site 2.

Originator (print)	SPDMS ID	Phone	Organization	Date	
R. Seale	T08011	1-3348	ETM	6/27/01	☒ Perm ☐ Temp ☐ Temp-Recycle

DEVIATION INDEX

WAD NO.

☒ PERMANENT ☐ TEMPORARY ☐ TEMP RECYCLE

S6444 REV: J CHG:01 (OMI)

DATE/TIME: 04/10/2001 05:39:54

TASK NO./SEQ. NO. 150

DEV NO.	SEQ/ STEP	EFFECTIVITY	QC/ PP&C	DATE	REMARKS
150-01	150 2		*	2001-04-09	

KSC FORM 4-470 (C/G 07/93)

United Space Alliance

TOP/WAD Deviation

Dev No. 150-01	DILS No. 87036 (S)	Page 1 of 1

TOP/WAD No.	REV/CHG/VER		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V)	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite
S6444	J01	☐ In Family ☒ Out of Family	E	30

First Use ☐ SRB BI- ☐ ET ☐ GSE ☒ STS-100
Effectivity: ☐ ORB /FLT ☐ FRCS/POD /FLT ☐ SSME /FLT
Affected: ☒ OMRS/ACOMC/OMP ☐ Design Req'ts ☐ Haz Step(s) ☐ PPE ☒ Internal Review Req.

Contractor OPR	Contractor Test Conductor	Gov't OPR
R. Seale Elm 4/5/01	Jim Taylor 4/9/01	PHH-2 4-6-01
Contractor Test Project Engineer	**Other**	**Gov't Project Engineer**
Sally Cully Connolly 4/9/01	Mark Wollen 4/5/01	
Contractor Safety	**Other**	**Gov't Test Director or Contractor Chief TC**
		Stephen Payne 4/9/01

Page Number: 140-1 (s/b 150-1) Step Number: 150-2

Delete following from step 150-2:

"OMRSD S00U00.011-1"

USA VM 067

Reason: OMRS S00U00.011-1 pertains to Film Review (Operation 140).

Originator (print)	SPDMS ID	Phone	Organization	Date	☒ Perm ☐ Temp ☐ Temp-Recycle
R. Seale	T08011	1-3348	ETM	4/5/01	

USA FORM 4-30A

USA
United Space Alliance

Pen and Ink Change Record

Pg 1 of 2 (1)

NO./REVISION: S6444 J41

EFFECTIVITY: OV-103 thru 105 — STS-105 Rwd 2

PAGE	SEQ/OP-STEP	CHANGE	APPROVAL QE/ENG
DEV 10-01 Pg 1/5	11-1	ADDED NOTE AS NOT PERFORMED QUALIFIER	R. Speed ETm 8/9/01
DEV 10-01 Pg 3/5	11-1	ADDED NOT PERFORMED BUY	R. Speed ETm 8/9/01
DEV 10-01 Pg 4/5	11-2	CORRECTED STEP NUMBER WAS: 11-1 IS: 11-2	R. Speed ETm 8/9/01
DEV 10-01 Pg 5/5	11-2	ADDED NOT PERFORMED BUY	R. Speed ETm 8/9/01
DEV 140-02 Pg 1/5	141-1	CORRECTED STEP NUMBER WAS: 11-1 IS: 141-1	R. Speed ETm 8/14/01
DEV 140-02 Pg 4/5	141-2	CORRECTED STEP NUMBER WAS: 11-1 IS: 141-2	R. Speed ETm 8/14/01
E0-1	E0-2	ADDED NOTE (FOR QUALIFIER) AND NOT PERFORMED BUY FOR 5/51	R. Speed ETm 8/16/01
141-1 DEV 140-02	Pg 1/5	ADDED NOTE FOR NOT PERFORMED QUALIFIER	R. Speed ETm 8/16/01
141-1	DEV 140-02 Pg 3/5	ADDED NOT PERFORMED	R. Speed ETm 8/16/01
141-2	DEV 140-02 Pg 5/5	ADDED NOT PERFORMED	R. Speed ETm 8/16/01

USA 29-510 Revised 06-99 (Flow)

R. Speed ETm 8/16/01